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THE MILITARY SURGEON

MEDICINE

JOURNAL OF
THE ASSOCIATION OF MILITARY SURGEONS
OF THE UNITED STATES

EDITED BY

JAMES ROBB CHURCH

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27/1/44

VOLUME XLIV

(Ja-Jne)
1919

WASHINGTON, D. C.
THE ASSOCIATION OF MILITARY SURGEONS
OF THE UNITED STATES
1919

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THE
MILITARY SURGEON

VOL. XLIV JANUARY, 1919 No. 1

ORIGINAL ARTICLES

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SANITATION IN CAMPS AND HOSPITALS ON THE BRITISH FRONT IN FRANCE[1]

BY CAPTAIN F. L. PLEADWELL
Medical Corps, United States Navy

(With forty-four illustrations.)

THIS paper is the outgrowth of observations and studies made in 1916-17, when the writer was on special duty abroad as a medical representative of the Navy and, as such, privileged to visit the British front in France. I have selected this subject for presentation because it is one which is of vital interest to the Army, and as many naval medical officers are now performing duties in the field with the Marines it becomes of equal importance to them.

In 1908, at the time of the creation of the British Territorial Force, sanitary companies were formed in London and a scheme of training instituted by these organizations which comprised, in addition to lectures on field and camp sanitation, a short course in military routine. During the progress of the war these companies have continued to be centers for the training of men assigned to the sanitary sections of the British Expeditionary Force. Both the First and the Second London Sanitary Companies have been constituted schools of instruction and have trained many men for duty in the sanitary sections going to France. Many of the ingenious sanitary devices one sees in the various areas on the British front, in the way of new and improved types of latrines, urinals, destructors, grease traps, camp ovens, etc., some of which are reproduced in the illustrations accompanying this paper, have had their origin in the training begun in the London companies.

Under regulations the sanitation in any military area is the concern of the officer commanding in that area, and he is made respon-

[1] Read at the annual meeting of the Association of Military Surgeons held at Camp Greenleaf, Fort Oglethorpe, Ga., October 14, 15 and 16, 1918.

sible for it, his medical officer acting simply as sanitary adviser. The chief work of sanitation, however, is in the hands of the sanitary section which is composed of a specialist sanitary officer, two noncommissioned officers and twenty-three enlisted men. The officer in charge of a sanitary section is very often not a medical man but one with experience in sanitation or sanitary engineering. Of the enlisted men several may be sanitary inspectors, others with trade experience, frequently comprising men of good general education, many of whom are serving in the ranks as privates.

Privates may be advanced in these organizations to honorary ranks as lance corporals or corporals. In addition there is a sergeant and a staff sergeant. The officer usually has the rank of lieutenant or captain.

The qualifications of men and officers selected for this duty are stated by Captain Moor, a pioneer in this field during the early period of the war, to be as follows:

> It is important that men assigned to this duty should be adaptable, keen for the work, and have a good general knowledge of field sanitation. They should, for instance, be able to sterilize water on a small or large scale, carry out an anti-fly campaign, know how to build furnaces, be capable of burning camp rubbish, feces and horse manure, construct grease traps, etc., and know how to remedy easily all minor sanitary defects in a camp. It is essential for them to be tactful in their camp inspections, clear in their reports and able to impress the sanitary squads with the importance of carrying out instructions promptly and thoroughly and without friction.

The sanitary section is the nucleus of a variable number of sanitary squads, composed of five enlisted men in charge of a noncommissioned officer. A sanitary squad is often detached and acts independently at some outlying position, as at a railway station on the line of communication.

When a new position is consolidated, the area advanced over is cleared of refuse, animal carcasses, etc., by fatigue parties from the fighting force operating under the sanitary section, and for temporary light duties at baths, laundries, etc., convalescents are often assigned for a short time before rejoining their units.

CAMP SANITATION

The "Field Service Regulations," the "Royal Army Medical Corps Training," the "Field Service Pocket-book," the "Manual of Elementary Military Hygiene," which are manuals issued under authority of the General Staff, British War Office, all present the general principles governing the location, arrangement and sanitary conduct of military camps, but this war has brought forward special

problems in camp sanitation, due not only to the character of warfare, which has rendered permanency of camp sites along the line of communications and at the base a major characteristic, but due also to the nature of the ground occupied by the forces in France.

It is my purpose, therefore, to dwell chiefly upon certain features of sanitation, as seen in various camps in Great Britain and on the western front, which necessity has developed and experience has proven effective, especially in the direction of improvised apparatus, of which a number of drawings will be shown. The nature of materials required for the construction of these sanitary devices, dimensions, etc., will also be indicated so that they can be reproduced for camp use.

The degree of sanitary perfection attained in any camp area may be said to depend largely upon the interest displayed by those in command of the unit and the degree of initiative and ingenuity exercised by the sanitary officer. The British regulations specifically state that the responsibility for the sanitary condition rests with the commanding officer, but, since the majority of commanding officers are only too willing to have the sanitary officer take complete charge of sanitation and support him fully in his efforts, the condition of any camp is generally reflective of the latter officer's interest, ability, and inventive capacity.

The sanitary requirements of the camps inspected in Great Britain and on the British front in France, which have been occupied by troops for months or even since early in the war, are somewhat different from those of temporary field camps, whose sanitary requirements are well known and fully described in existing handbooks. The congestion in the permanent camps, the limited space, and the necessity of disposing of refuse within the limits of the camp itself have rendered it all the more essential that careful attention be devoted to cleanliness of site and to satisfactory methods of disposal of excreta, kitchen wastes and wash and ablution water. The difficulties of sewage disposal, in the absence of sewers or any water-carriage system, are enhanced in many places along the coast in France by the nature of the soil, which is made up of strata of chalk covered by a variable depth of sand. This is the prevailing formation over a long stretch of territory on the base line. Inasmuch as many of the methods for the removal of wastes and wash water in this area depend for their efficiency upon porosity of the soil, the question of the geological character of the soil upon which a camp is situated is very important. Tactical considerations permitting sites which promise difficulties of this sort should be re-

jected. Practically this has rarely been necessary, for even where impermeable strata exist, when reasonably accessible from the surface, they have been pierced, and access to porous soil secured. An inefficient system soon leads to water-logging of the soil, fouling of the surface, and the resulting conditions may even menace health.

The Disposal of Excreta

The more or less permanent occupation of camp sites, which has been a feature of this war, has rendered the use of any form of trench latrine impracticable, except for a limited time, and in the absence of a water-carriage system and sewers most camps have been dependent upon some form of bucket latrine for disposing of excreta. In the semi-permanent and permanent camps or hospitals on the British front, some variety of seat and bucket is commonly seen. These aim to be fly-proof, but a lack of close adjustment between the seat and the top of the bucket, together with poorly fitting covers to seats, often prevent them being so. As a rule there should be not more than one inch of clearance between the top of the bucket and the seat of the latrine, and a guard or stop should be provided to keep the bucket properly aligned under the seat.

Attempts are made to discourage flies by cleaning buckets with cresol or crude oil and by leaving cresol emulsion in each bucket to submerge the feces. As a rule, however, flies are not kept away by the cresol, and not uncommonly a pyramid of feces is seen rising above the level of the solution. In some camps the latrine attendant has been observed igniting the toilet paper in each bucket to drive away flies, as well as for a surface sterilization, and in some camps a tightly fitting whitewashed cover is used to exclude flies, this being pushed over the bucket and under the seat. Self-closing seats and close approximation of the top rim of a flat-topped bucket to the under side of the seat constitute the best fly-excluding method, but buckets of different heights and broken seat covers often render these measures ineffective. To overcome these difficulties strict supervision and maintenance of material in good order are enjoined. Many latrine buckets have a lip which rises higher on one side, so that close approximation to the seat is impossible, while the same effect is produced if the lugs for the handle project above the rim of the bucket.

Before being placed in position for use, each bucket is daily smeared on the inside with crude oil, and filled with cresol emulsion (one ounce to a gallon of water) to a depth of 3 to 4 inches.

A bucket should not be allowed to get more than half full before collection. After emptying, the bucket is mopped out thoroughly with cresol solution.

The most valid objection to the bucket system is that the buckets are merely a step in the process of disposal, for they must be collected and emptied. The alternative system of earth burial has the advantage that the place of immediate deposition is the place

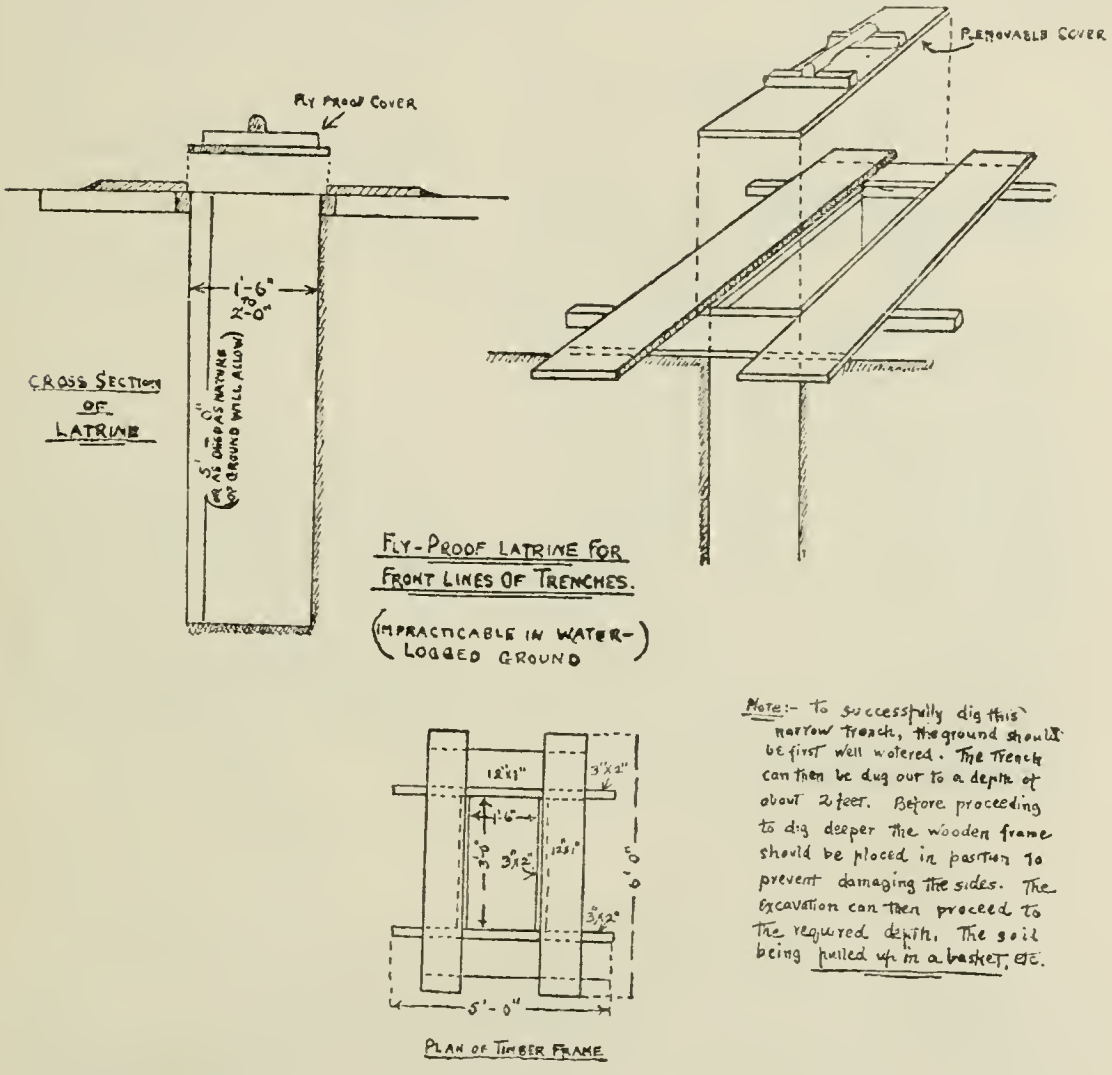
REMOVABLE COVER
FLY PROOF COVER
1'-6"
2'-0"
CROSS SECTION OF LATRINE
5'-0" (OR AS DEEP AS NATURE OF GROUND WILL ALLOW)
FLY-PROOF LATRINE FOR FRONT LINES OF TRENCHES.
(IMPRACTICABLE IN WATER-LOGGED GROUND)
12"x1"
3"x2"
1'-6"
2'-0"
3"x2"
12"x1"
3"x2"
5'-0"
5'-0"
PLAN OF TIMBER FRAME
Note:- To successfully dig this narrow trench, the ground should be first well watered. The trench can then be dug out to a depth of about 2 feet. Before proceeding to dig deeper the wooden frame should be placed in position to prevent damaging the sides. The excavation can then proceed to the required depth. The soil being pulled up in a basket, etc.

FIG. 1.

of ultimate disposal, but for congested areas of permanent and semi-permanent camps near the base line and on the line of communication, burial is out of the question and the bucket system is obligatory. Further up the line in less congested areas the trench latrine system was occasionally seen. Two common types of deep trench fly-proof latrines are shown in Figs. 1 and 2.

In the bucket latrine system a sharp watch is kept for leaky

buckets and, when found, these are condemned and replaced. The buckets are cleaned in a solution containing one part of cresol to ten parts of water, and washed with a long-handled brush. They are then allowed to drain and wiped inside and out with a rag dipped in kerosene. The outside of the bucket is kept bright by bathbrick or fine sand.

The disposal of the contents is carried out within the camp itself by incineration, except rarely when disposal by burial is feasible. Once daily the buckets are collected by carts or carriers,

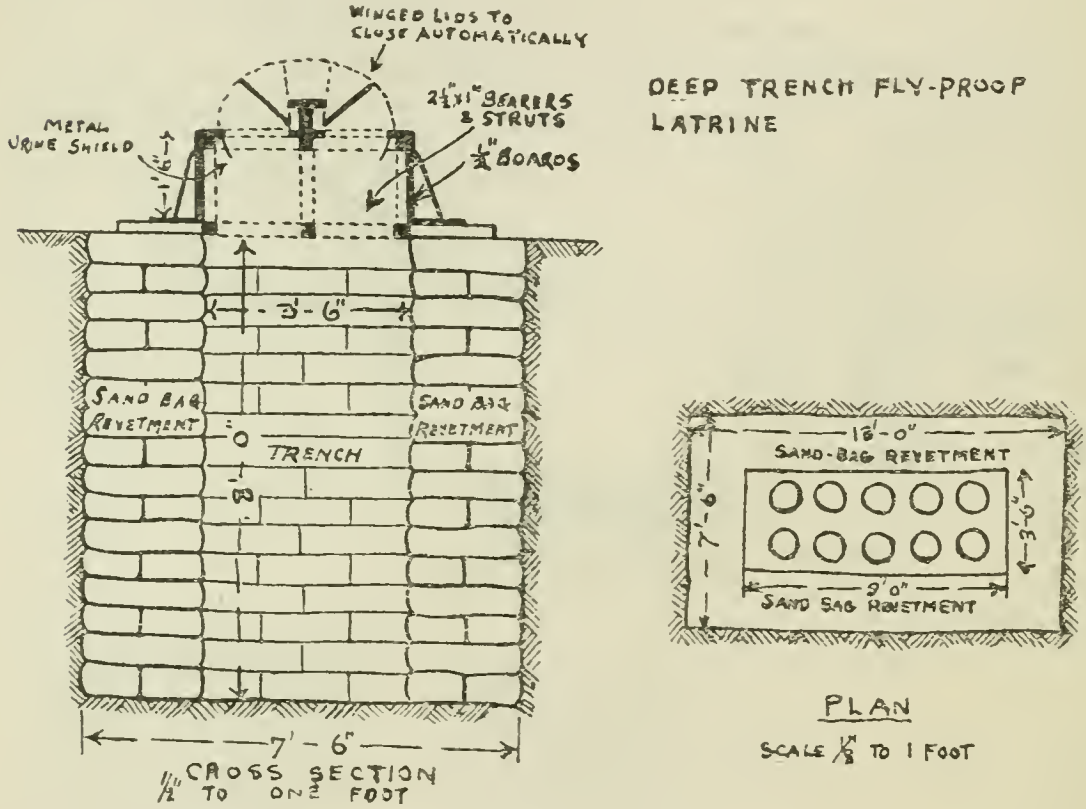

FIG. 2.

and transported to the incinerator. If carts are used the buckets are suspended by their handles to hoops with swivel hooks, in order to minimize the slopping over of the contents when passing over rough ground.

In front-line trenches buckets are removed by the outgoing troops, empty buckets being brought up by the relief. Several types of portable latrine buckets are seen, all improvised and made of material readily procurable about camps. Some of those most commonly employed are shown in the drawings appearing in Figs. 3, 4 and 5.

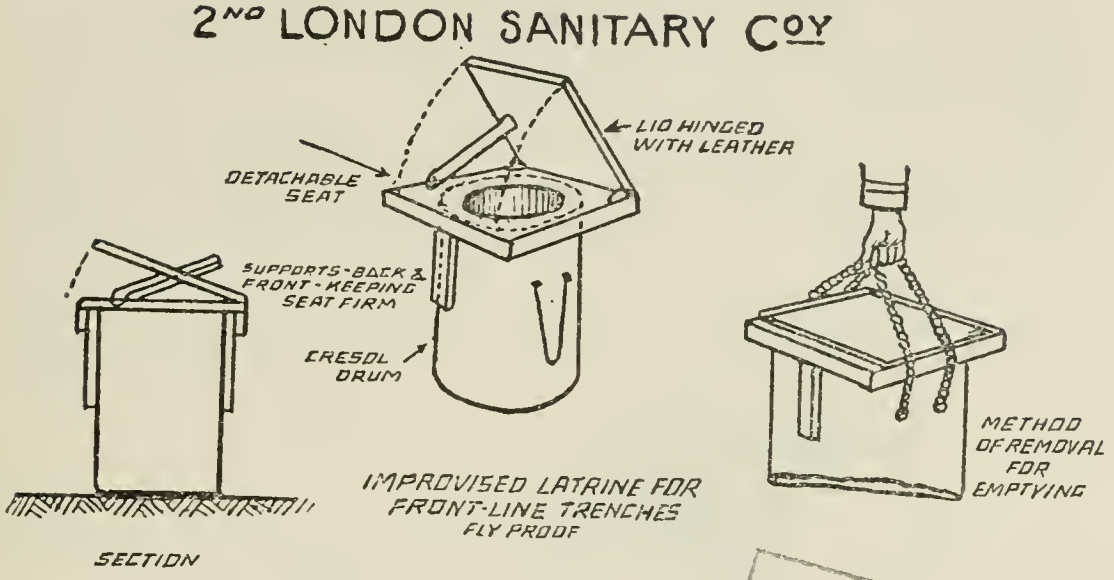
2ND LONDON SANITARY COY
LID HINGED WITH LEATHER
DETACHABLE SEAT
SUPPORTS - BACK & FRONT - KEEPING SEAT FIRM
CRESOL DRUM
METHOD OF REMOVAL FOR EMPTYING
IMPROVISED LATRINE FOR FRONT-LINE TRENCHES FLY PROOF
SECTION

FIG. 3

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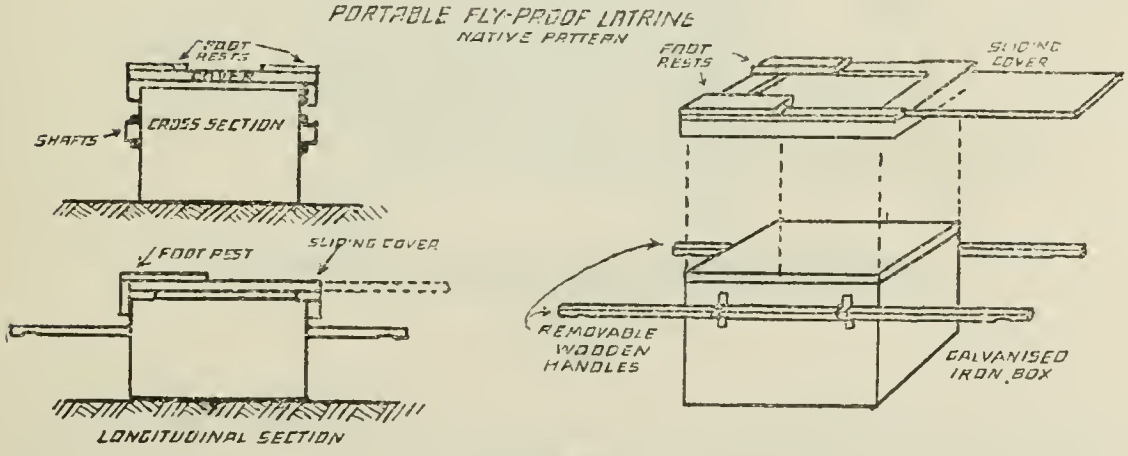
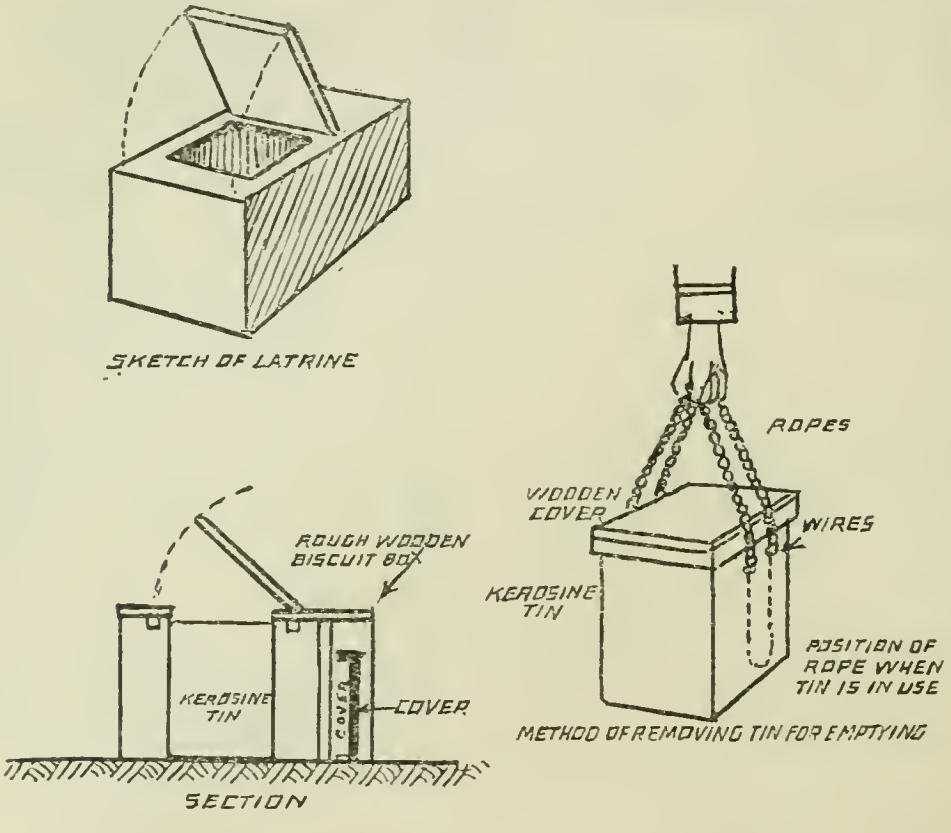


FIG. 4.

The following calculations, which have been abstracted from Lelean, give us some idea of the problem involved in the process of excreta disposal by incineration:

Assuming that each person in the camp contributes daily 4½ ounces of feces, containing 3 ounces of water, and 5 ounces of "defecation urine," the latrine bucket will receive a total of 8 ounces of liquid per person per diem. Therefore, from a battalion of standard strength of 1.000 men, 600 pounds of mixed feces and urine (500 pounds liquid, 100 pounds solid matter) is to be dealt with daily. This is usually collected in 10 buckets of about 60 pounds each. As feces alone contain 70 per cent of water they cannot be burned easily, except by mixing them with some combustible matrix and by feeding them a little at a time into a considerable volume of material already raised to a high heat. Before doing this, they must be separated



IMPROVISED LATRINE FOR FIRST LINE TRENCHES
(FLY PROOF)

FIG. 5.

from the urine contents of the bucket as much as possible. The urine and cresol emulsion is drained off into a specially constructed urine pit. After the liquid portion in the bucket is poured off, the fecal matter remaining is mixed with dry camp refuse or stable litter or with sawdust to such an extent as to make the resulting mixture of the consistence of a thick paste. As the total combustible refuse from the standard unit (battalion) averages 1,500 pounds per diem, the unit should be self-supporting in its incineration, and this is usually the case. It has been found that fluid is evaporated by 66 per cent of its weight of combustible matrix. so to completely incinerate the 500 pounds of liquid would only require 336 pounds of litter or sawdust.

At the incinerator each bucket of mixed fecal matter and refuse is fed regularly and systematically into the fire. The technique of this process is described later. The difficulty of combustion is not insuperable, especially if the supply of fuel is ample.

To be efficient, incinerators must be of such a type as to destroy completely and rapidly all material without emitting odorous gases in or about the camp. Closed incinerators are mostly used, as in these it is possible to produce a hot fire before introduction of the material to be burned. They are provided with baffle plates, which intercept and divert the products of combustion as they leave the fire grate, and insure their complete reduction to simpler gaseous products. (Fig. 6.)

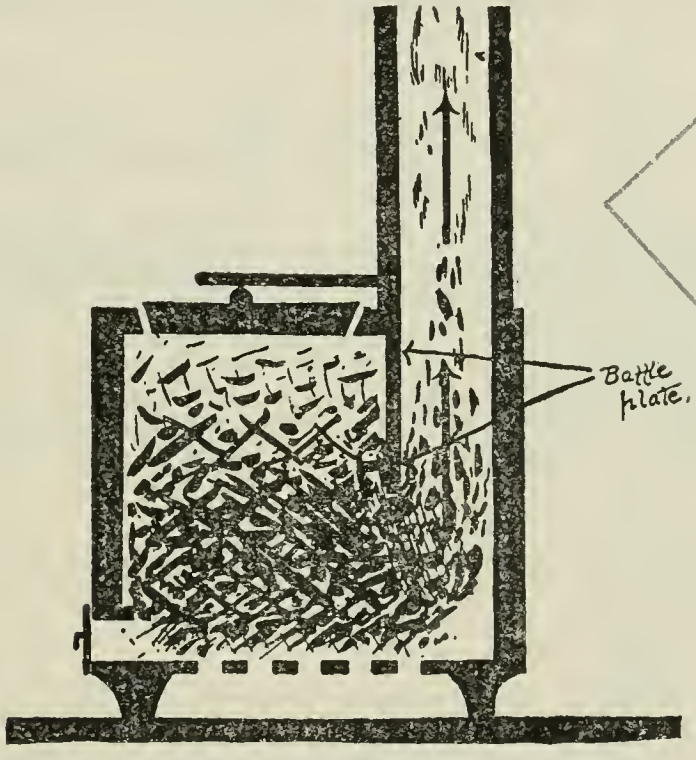


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Fig. 6. (After Lelean.)

Incinerators usually have chimneys not less than 10 feet high in order to get the necessary draft. An early type was made of brick, square at the bottom for about 6 feet, then tapering inward, and with a brick chimney vertically above the fire; it included an arrangement for heating water, the total height being about 14 feet. These act efficiently until the bricks crack and disintegrate from heat. Detailed drawings of this type are shown in Fig. 8.

An ingenious type of improvised camp incinerator is built of

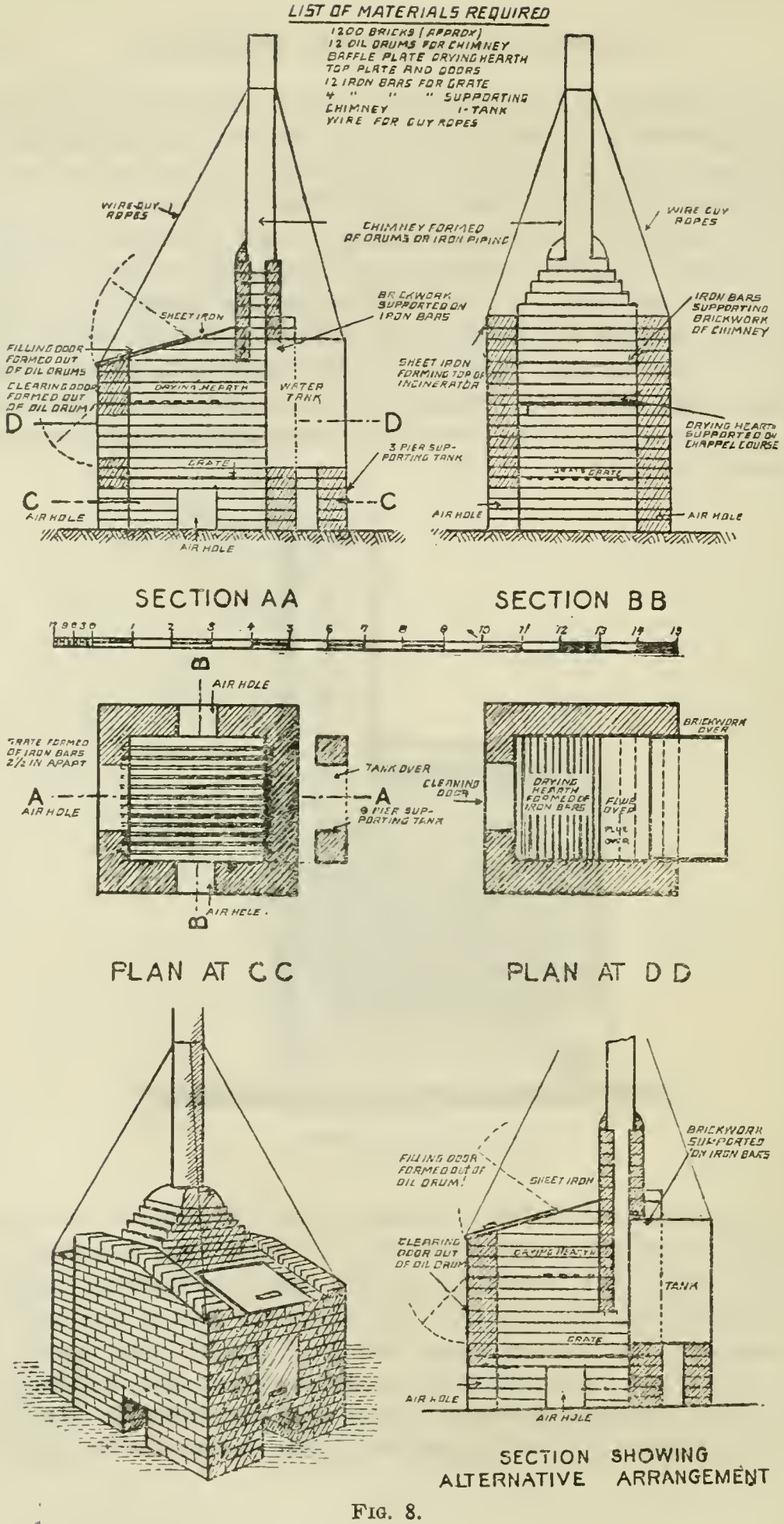

LIST OF MATERIALS REQUIRED
1200 BRICKS (APPROX)
12 OIL DRUMS FOR CHIMNEY
BAFFLE PLATE DRYING HEARTH
TOP PLATE AND DOORS
12 IRON BARS FOR GRATE
4 " " " SUPPORTING
CHIMNEY 1-TANK
WIRE FOR GUY ROPES
WIRE GUY ROPES
CHIMNEY FORMED OF DRUMS OR IRON PIPING
BRICKWORK SUPPORTED ON IRON BARS
SHEET IRON
FILLING DOOR FORMED OUT OF OIL DRUMS
CLEARING DOOR FORMED OUT OF OIL DRUM
DRYING HEARTH
WATER TANK
GRATE
3 PIER SUPPORTING TANK
AIR HOLE
SHEET IRON FORMING TOP OF INCINERATOR
IRON BARS SUPPORTING BRICKWORK OF CHIMNEY
DRYING HEARTH SUPPORTED ON CHAPPEL COURSE
SECTION AA
SECTION BB
GRATE FORMED OF IRON BARS 2½ IN APART
TANK OVER
CLEARING DOOR
9 PIER SUPPORTING TANK
BRICKWORK OVER
DRYING HEARTH FORMED OF IRON BARS
FLUE OVER
PLAN AT C C
PLAN AT D D
BRICKWORK SUPPORTED ON IRON BARS
FILLING DOOR FORMED OUT OF OIL DRUM
SHEET IRON
CLEARING DOOR OUT OF OIL DRUM
DRYING HEARTH
TANK
GRATE
SECTION SHOWING ALTERNATIVE ARRANGEMENT

FIG. 8.

small tins filled with a mixture of clay and breeze (refuse, cinders or fine coal), fitted with charging and raking doors made of ham-

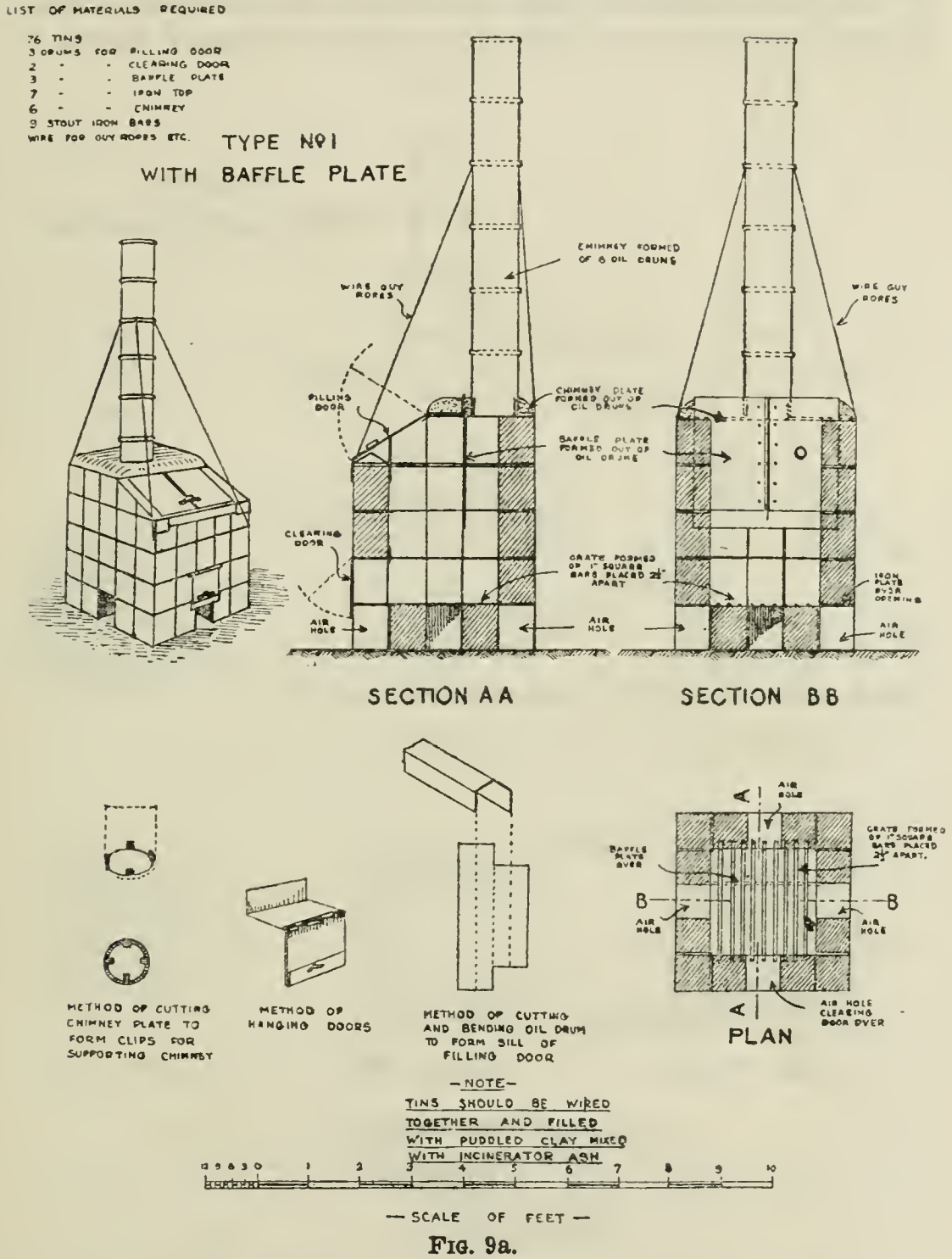

LIST OF MATERIALS REQUIRED
76 TINS
3 DRUMS FOR FILLING DOOR
2 - - CLEARING DOOR
3 - - BAFFLE PLATE
7 - - IRON TOP
6 - - CHIMNEY
9 STOUT IRON BARS
WIRE FOR GUY RODS ETC.
TYPE N°1
WITH BAFFLE PLATE
CHIMNEY FORMED OF 6 OIL DRUMS
WIRE GUY RODS
FILLING DOOR
CHIMNEY PLATE FORMED OUT OF OIL DRUMS
BAFFLE PLATE FORMED OUT OF OIL DRUMS
CLEARING DOOR
GRATE FORMED OF 1" SQUARE BARS PLACED 2½" APART
AIR HOLE
IRON PLATE OVER OPENING
SECTION A A
SECTION B B
METHOD OF CUTTING CHIMNEY PLATE TO FORM CLIPS FOR SUPPORTING CHIMNEY
METHOD OF HANGING DOORS
METHOD OF CUTTING AND BENDING OIL DRUM TO FORM SILL OF FILLING DOOR
BAFFLE PLATE OVER
PLAN
AIR HOLE CLEARING DOOR OVER
-NOTE-
TINS SHOULD BE WIRED TOGETHER AND FILLED WITH PUDDLED CLAY MIXED WITH INCINERATOR ASH
— SCALE OF FEET —

Fig. 9a.

mered-out cresol-drums, and a cresol-drum chimney. When the faces of the tins inside the furnace are burned away the clay and breeze has burnt hard and retains its position and slope. Figs. 9a and 9b show the material and construction of this type, one with, the other without a baffle plate.

In many camps the small Horsfall incinerator was seen. This has an outer casing of metal (cast iron) and a firebrick lining. If these incinerators are properly cared for, they are quite efficient. The fire must not be too hot, care must be exercised not to let

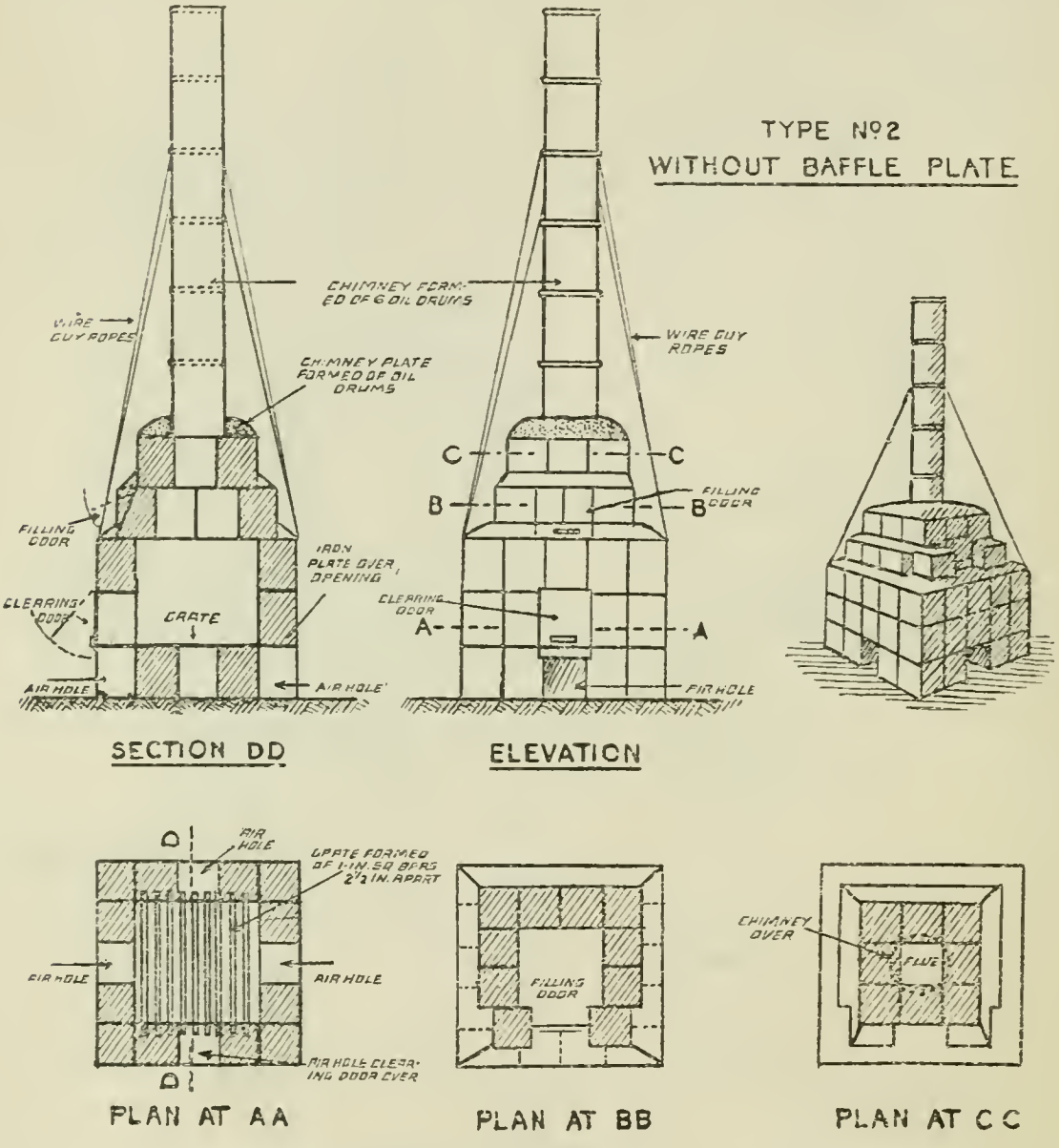


Fig. 9b.

feces touch the heated firebrick lining, and the incinerator must also be protected from the rain. The expense and weight of these furnaces prohibit their extensive use, and various extemporized incinerators can do equally good work.

The camp incinerator and the operating platform on which it rests are usually placed under shelter of a shed, large enough to protect from the weather and to provide storage space for the necessary tools, such as shovels, brooms, brushes, etc., while one section should have shelves for basins, soap and towels for the men employed about the furnace. The work is not so unpleasant as might seem, and after the men get accustomed to working the plant effectively, little odor is noticed. Overalls, extra boots and old uniforms are provided, the men sleep in separate tents and eat at separate messes, and are not employed in any other way. They are often what are termed "P. B." men ("permanent base" men with minor disabilities preventing assignment to more active work). They are given frequent opportunities for bathing and are paid eight pence a day extra.

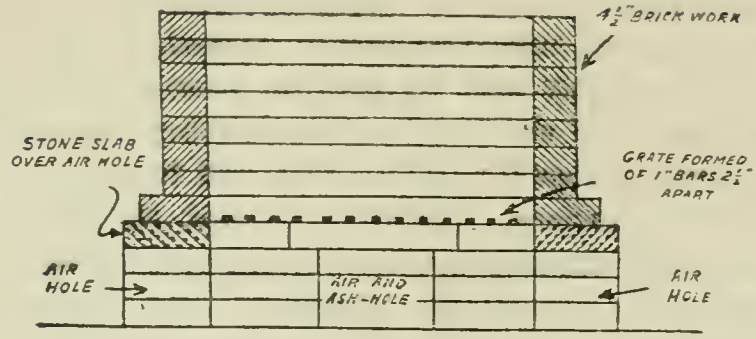
Operative Technique for Incineration

The whole secret of efficiency in successful incineration of feces appears to rest in intelligent stoking and avoidance of choking the fire by too rapid introduction of undiluted fecal matter. A fire is started with ordinary fuel and dry camp refuse, and only when this is burning briskly and the inside of the incinerator is well heated is the material introduced.

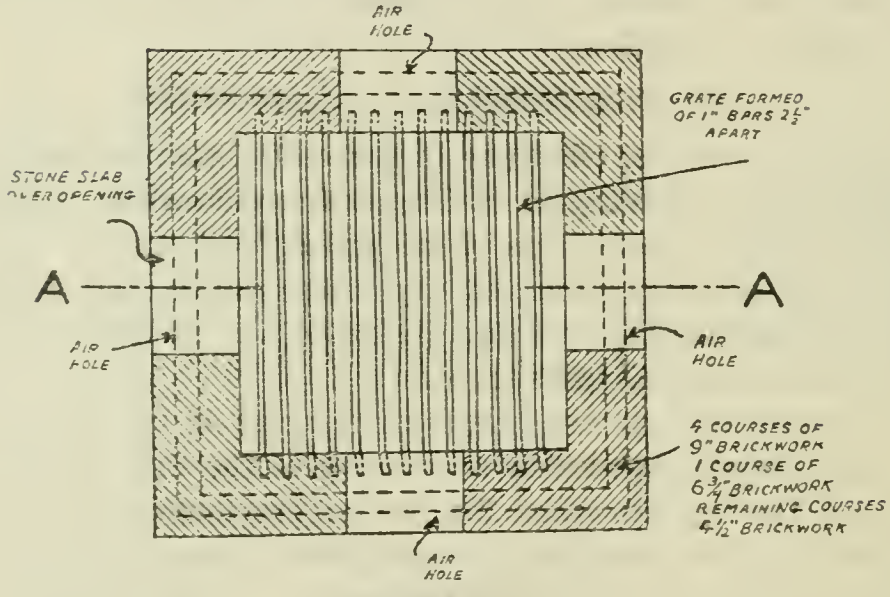
The proper way to add the fecal mixture is by first scraping out a bowl-shaped depression on the top of the fire. Each bucket is fed into the furnace when the matter previoussly introduced is destroyed, the fire being kept at maximum intensity by the introduction of fuel and dry refuse from time to time. It is usually necessary to introduce a new charge of feces every half-hour. The total refuse from 1,000 men should be destroyed in ten hours by the ordinary size incinerator and, if damped down at night, the fire should burn until morning. Early in the morning the stoker forces the fire briskly so that the incinerator is working at its maximum by the time the latrine carriers arrive.

The open types of incinerator were rarely seen on the British front; they were referred to as having many disadvantages, namely, fire slow to make and start, wasteful of fuel, offensive from odors and from contents being blown about, and liable to be put out of action by rain. Drawings of a number of open types, such as the rock-pile, square, bee-hive, horseshoe, are shown in Figs. 10a and 10b. A combined incinerator and latrine and an improvised field incinerator are shown in Figs. 11 and 12.

SQUARE

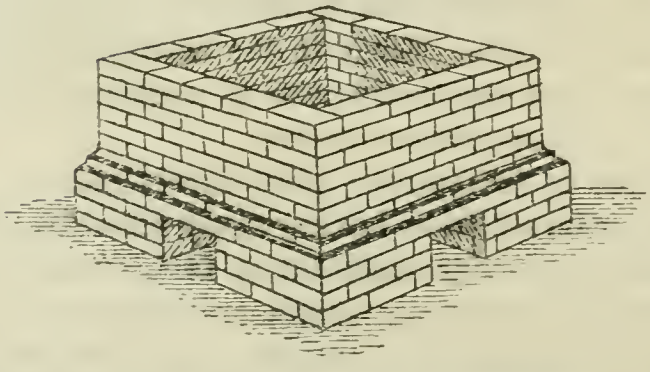


SECTION A A



PLAN

SCALE ¾ INCH = 1 FOOT

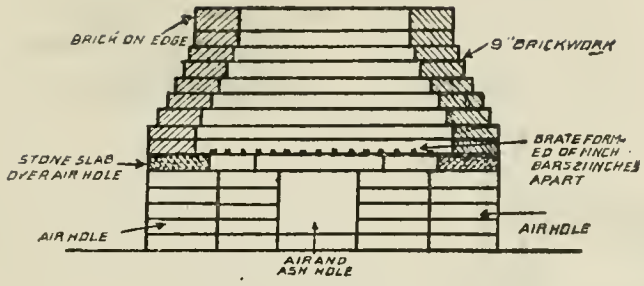


LIST OF MATERIALS REQUIRED

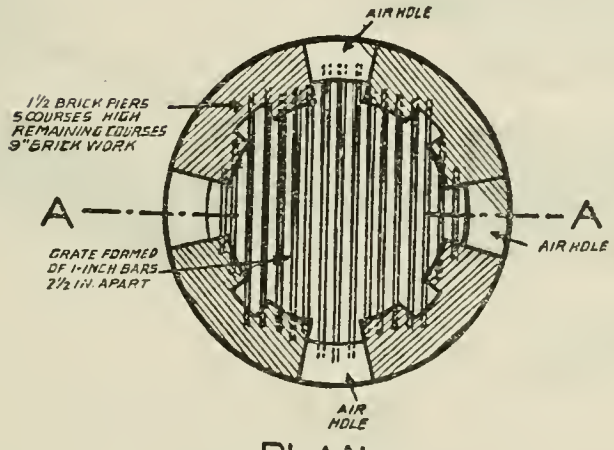
350 BRICKS (APPROX)
4 STONE SLABS
12 IRON BARS

FIG. 10a.

BEE - HIVE

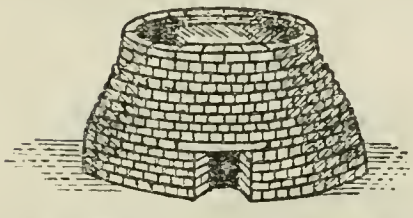


SECTION AA



PLAN

SCALE ½ INCH = 1 FOOT-



LIST OF MATERIALS REQUIRED

600 BRICKS (APPROX)
4 STONE SLABS
12 IRON BARS

HORSE - SHOE

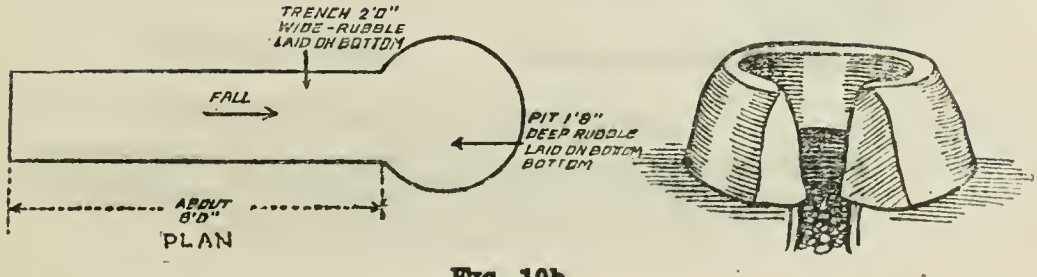


Fig. 10b.

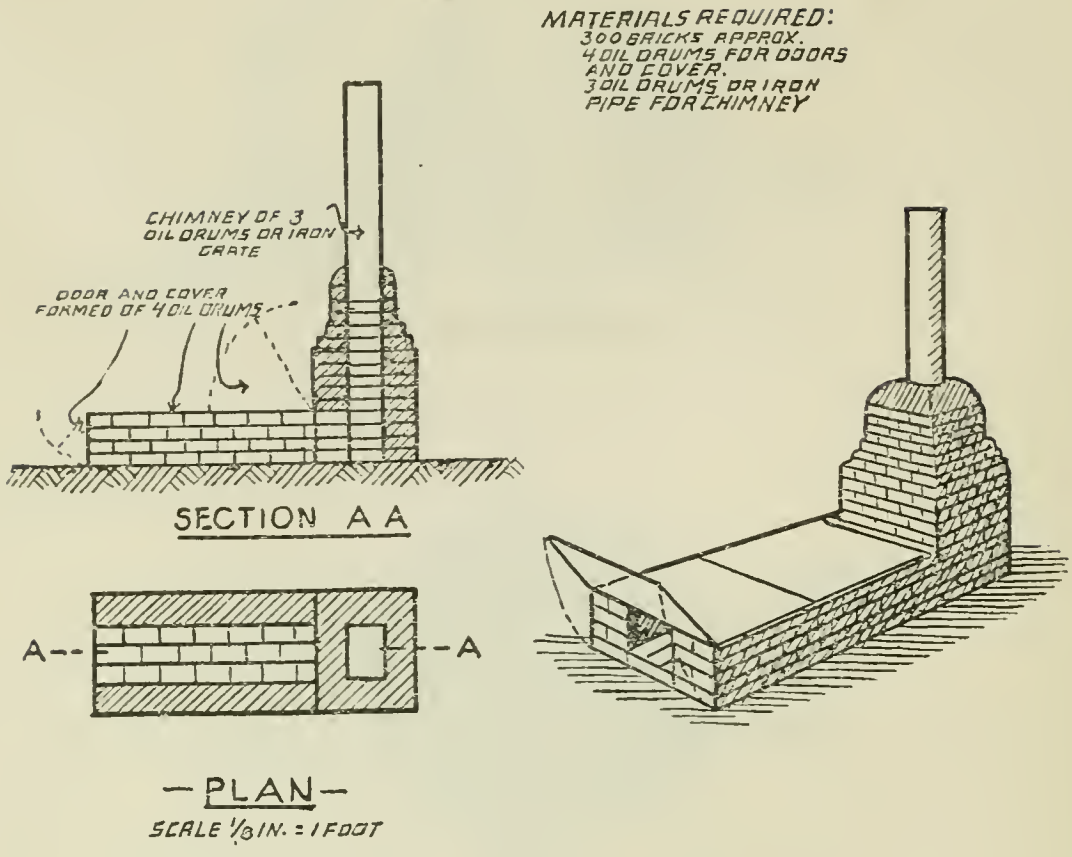
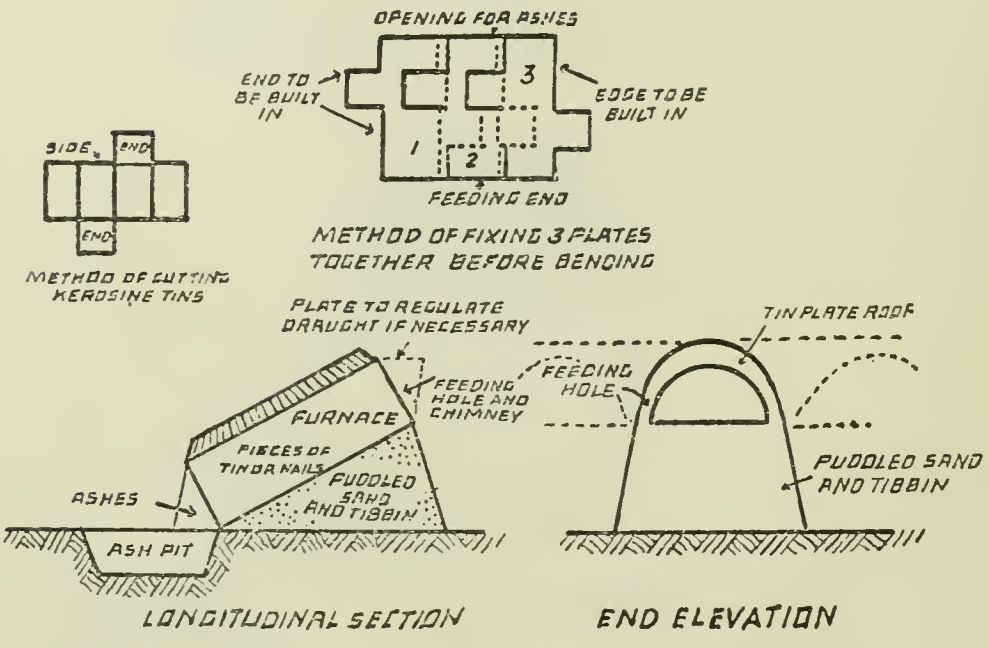


FIG. 11.



IMPROVISED FIELD INCINERATOR

NOTE: ANY NUMBER MAY BE CONSTRUCTED IN A ROW, HAVING ONE LONG BASE, ONE LONG ASH PIT, AND SPACES BETWEEN ROOFS FILLED IN WITH PUDDLED SAND AND TIBBIN. AS SHOWN DOTTED ON ELEVATION.

FIG. 12.

The Disposal of Liquids Left in Latrine Buckets

The separation of the liquid from the solid excreta, and the disposal of the former and of the contents of the night urine pails (seldom seen), are operations difficult to perform without fouling the ground. When the incinerator is built upon a concrete floor, a hopper can be arranged to lead by way of a pipe through the floor into a urine soakage pit, affording the maximum degree of cleanliness. If a concrete floor is not available, a hopper in the form of a shallow rectangular funnel not less than 2 feet wide, so that the bucket can be placed inside the hopper before being tipped up for pouring off the liquid, can be constructed. Such a hopper is shown in Fig. 13, which I have reproduced from an article by Captain Ellis, R. A. M. C.

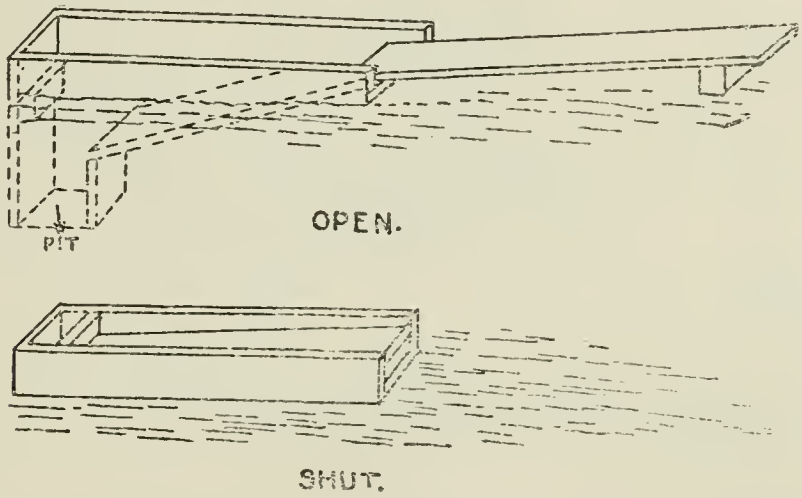


Fig. 13. (After Ellis.)

In methods of disposal of excreta by incineration, it is a great advantage to have the feces and the "defecation urine" deposited in separate containers, for it is the latter which complicates the easy disposal of the former. This has been sought by arranging two containers under the latrine seat, or a bucket for the feces and a trough placed where it would receive the urine as passed. Another scheme is to fit a seat and cover on an ordinary biscuit or coffee box, which ordinarily contains two tins, the opening of the seat being so adjusted that urine falls into one tin and feces into the other. A tight-fitting cover is fitted to the box; handles on the tins facilitate carrying to the urine pit and incinerator.

Urine Soakage Pit.—A pit is dug 6 feet square and of a depth necessary to reach a permeable stratum. The depth varies in different localities, but generally in this area porous soil can be reached within 12 feet of the surface. This pit is filled to within

2 feet of the ground level with perforated burnt-out tins, stones or coarse clinkers. A pipe of cresol drums or a wooden channel is built into the center of the pit, its lower end projecting a few inches into the collection of tins and its upper end protruding 18 to 24 inches above the level of the ground. Drain pipes, at least 9 inches in diameter, are sometimes used in place of the cresol drums, and if the pit is to be used as a urinal, tin funnels are fitted at the four corners. The remainder of the pit is then filled with earth, first covering the tins with a thickness of coarse sacking to prevent sand

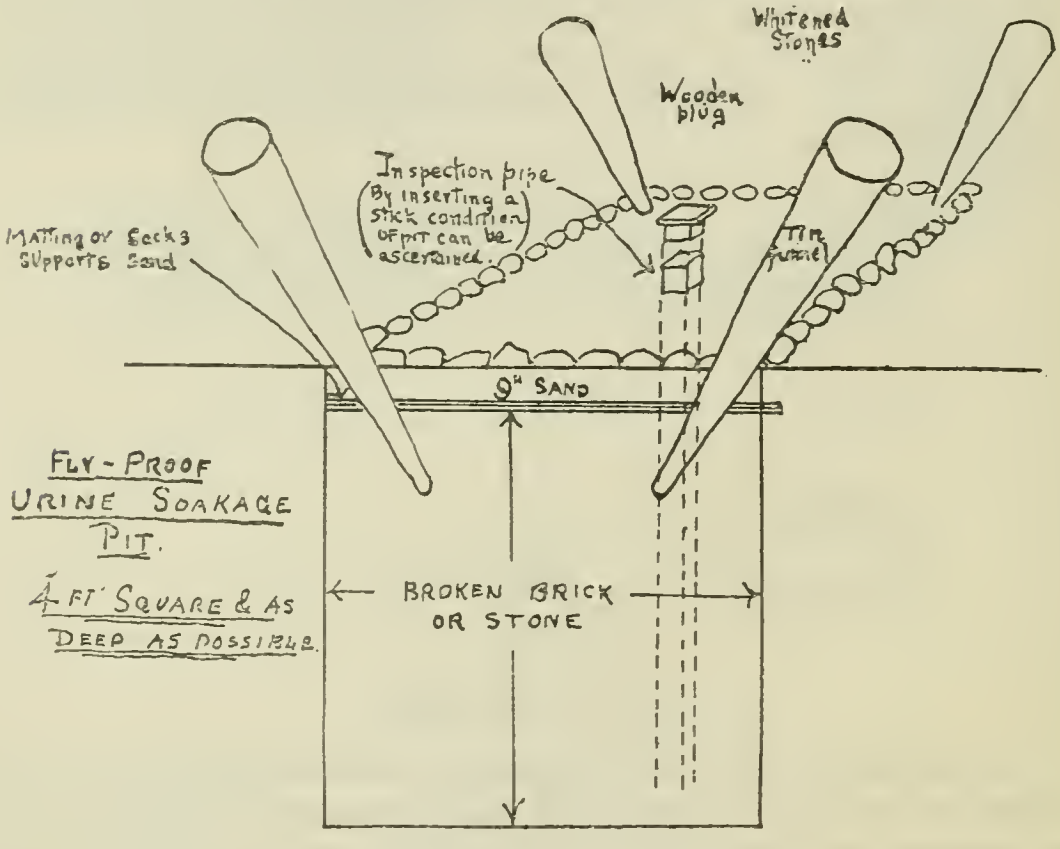


FIG. 14.

or earth from settling down; the surface is either concreted, re-turfed or paved with bricks. A drawing of a urine soakage pit with funnels and inspection and sounding pipe is shown in Fig. 14.

A strainer pierced with quarter inch holes is placed in the cresol drums. To separate the mixture of feces and urine, some operators simply pour off the liquid contents of the bucket without disturbing the solid contents and paper, while others slowly pour the whole contents of the bucket onto a layer of small coal fragments in the strainer. The urine runs through the strainer into the pit, the bulk of the feces and paper remaining on the coal, which can then be stoked into the incinerator after admixture with dry

litter or sawdust. If the feces are soft or have been soaked in urine for some time, a certain quantity passes through the strainer. This tends to choke the urine pit, and hence it is best to avoid leaving the feces in contact with urine longer than necessary.

Disposal of the Liquid Wastes in Camps

The liquid wastes to be disposed of in camps, other than urine, fall into two classes and comprise those from kitchens and cookhouses, and those from wash-rooms, bathrooms and ablution places. The majority of camps inspected employed some method of land treatment of liquid wastes. This consists of a downward filtration of the waste water into the sub-soil spaces. To be effective for any length of time, all waste water should undergo preliminary treatment for the purpose of removing suspended solids, chiefly grease or soap. If these are not adequately removed, the absorbent power of the soil is soon diminished by clogging of its interstices; it then becomes water-logged, the water ponds on the surface, and a nuisance is soon created. The carriage of these wastes into underground spaces without fouling the surface or polluting surroundings represents a difficult problem. This is particularly true in areas where the available soil lacks porosity or is underlaid by impermeable strata of chalk. Such strata must be pierced in order to render any downward filtration scheme effective. Many camps along the base line in France are necessarily located over sandy areas, the sand being only a few feet in depth, with layers of chalk beneath. These camps may contain thousands of men, and the disposal of wastes from a population of this size, in a limited area, is a sanitary problem of considerable magnitude. It is rarely possible to allow the direct passage of waste water from these camps into streams, even when available, as it is not practicable to adopt methods which would guarantee an innocuous effluent.

There are three methods, or combinations of methods, by which waste and ablution water is usually disposed of in these areas, viz., surface irrigation, sub-soil irrigation and soakage pits or trenches. A typical soakage pit is essentially the same as that described under disposal of urine. Before waste water can be disposed of by filtration it must be treated, to remove certain material, like grease, which is fatal to the life of a soakage pit, and soap, which acts similarly to clog the soil interstices. Grease predominates in the water from the kitchen or cookhouse, and soap from the baths and ablution places. It is also essential that all gross particles of meat, vegetables, etc., be first removed by sieves or strainers, and the

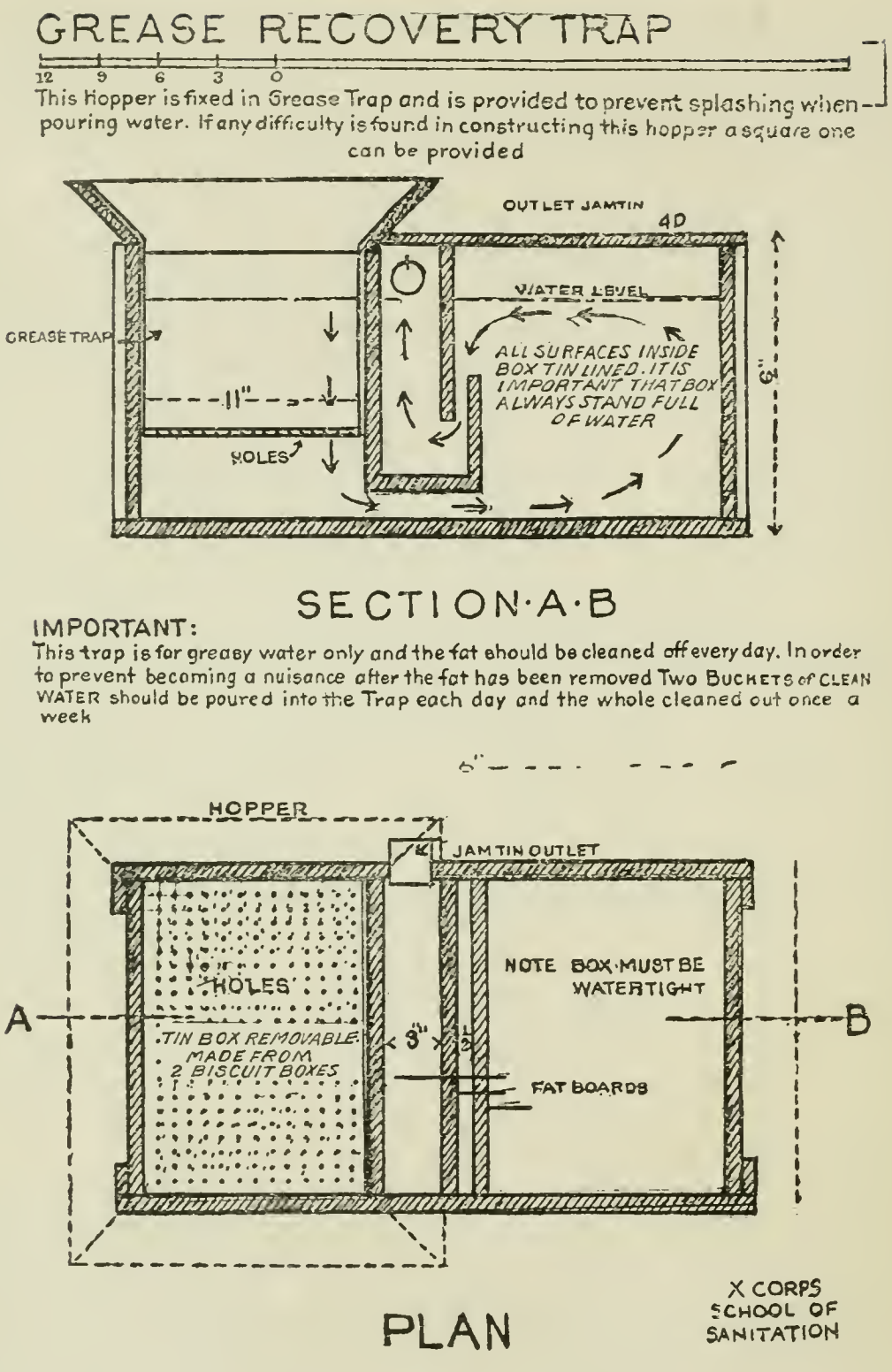

GREASE RECOVERY TRAP
12 9 6 3 0
This Hopper is fixed in Grease Trap and is provided to prevent splashing when pouring water. If any difficulty is found in constructing this hopper a square one can be provided
OUTLET JAM TIN
4D
WATER LEVEL
GREASE TRAP
ALL SURFACES INSIDE BOX TIN LINED. IT IS IMPORTANT THAT BOX ALWAYS STAND FULL OF WATER
11"
HOLES
SECTION·A·B
IMPORTANT:
This trap is for greasy water only and the fat should be cleaned off every day. In order to prevent becoming a nuisance after the fat has been removed Two BUCKETS of CLEAN WATER should be poured into the Trap each day and the whole cleaned out once a week
HOPPER
JAM TIN OUTLET
HOLES
NOTE BOX MUST BE WATERTIGHT
A
B
TIN BOX REMOVABLE MADE FROM 2 BISCUIT BOXES
3"
FAT BOARDS
PLAN
X CORPS SCHOOL OF SANITATION

FIG. 15.

finer particles by sedimentation. A certain amount of grease and coarser particles of food refuse are sometimes removed by filtration filtering material, and the relative inadequacy of this method, have

through layers of straw, hay or grass, which is later removed and burnt. The difficulty of obtaining a sufficient supply of combustible led to the adoption of grease traps or boxes for eliminating excess of grease and soap, and for sedimentation of some of the finer material.

These traps are usually rectangular covered boxes about 4 feet long, 2 feet wide and 2 feet deep, with baffle partitions or plates extending from above the level of the contained liquid to within a few inches of the bottom and across the full width of the box. A second baffle is placed at the outlet. A removable perforated tray

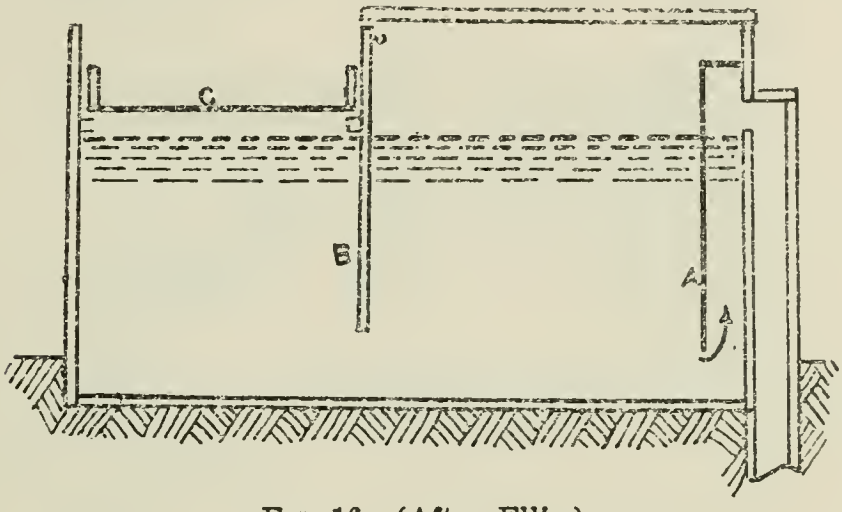


Fig. 16. (After Ellis.)

in the top of the box serves to strain out coarser particles. At least twice a day the sanitary squad skims off the grease which collects on the surface of the water. The sediment which collects in the bottom of the box is removed less often, but at least once a week. It is important to have the box large enough to contain constantly a considerable bulk of water which will serve to cool the hot, greasy water from cooking kettles, and thus prevent the melted grease from being swept through the trap into the pit. The opening of the grease box should be of sufficient size to allow emptying large camp kettles without spilling. Several types of grease trap are shown in Figs. 15, 16, 17, 18 and 19, and a pit for kitchen sullage water in Fig. 20.

The cleaning of cooking utensils is much facilitated by the table shown in Fig. 21. This is made of corrugated iron 10 feet by 3 feet, with clean (baked) sand in a box at one end and a grease trap at the other.

An alternative system is to lead the waste water from kitchen

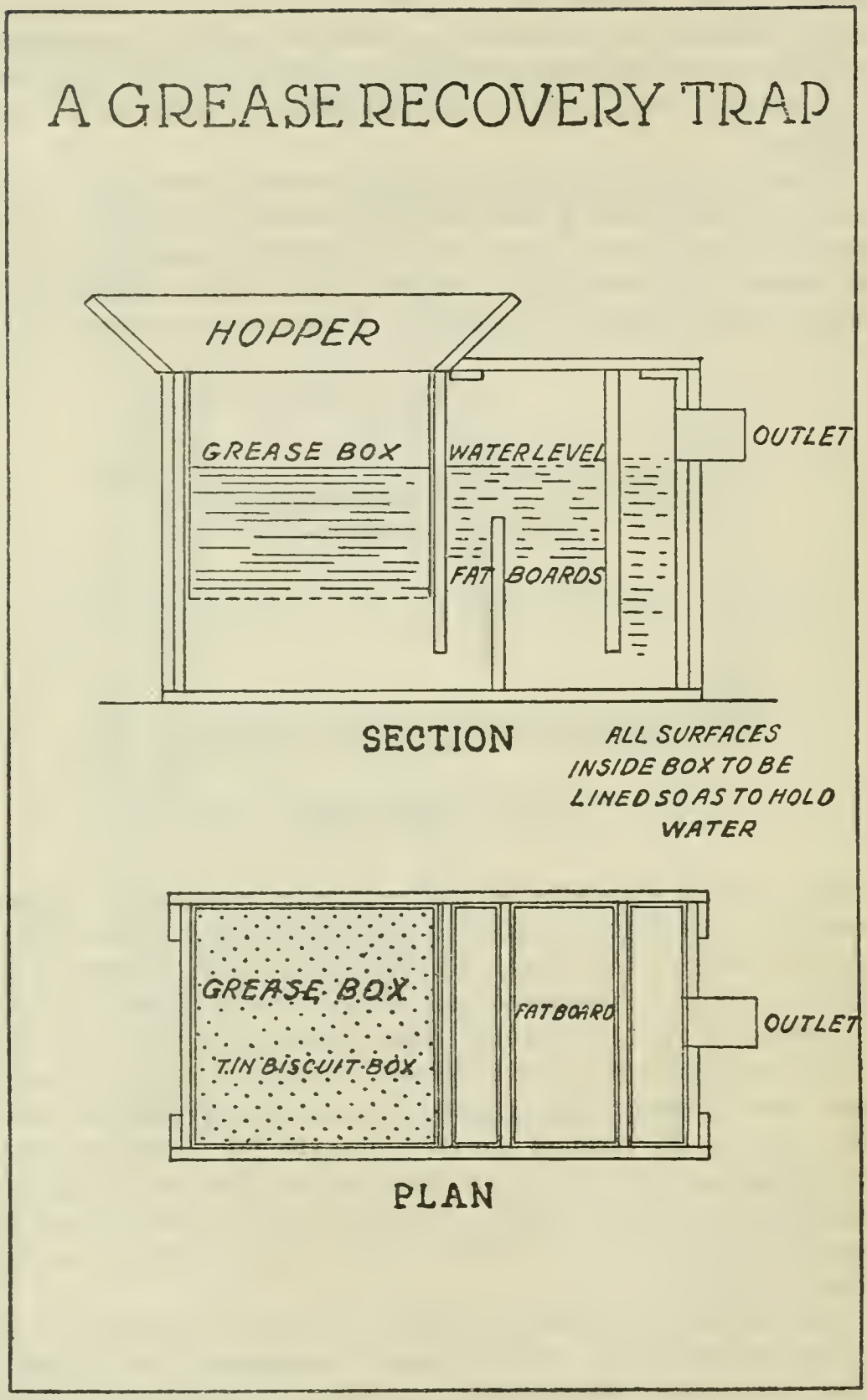
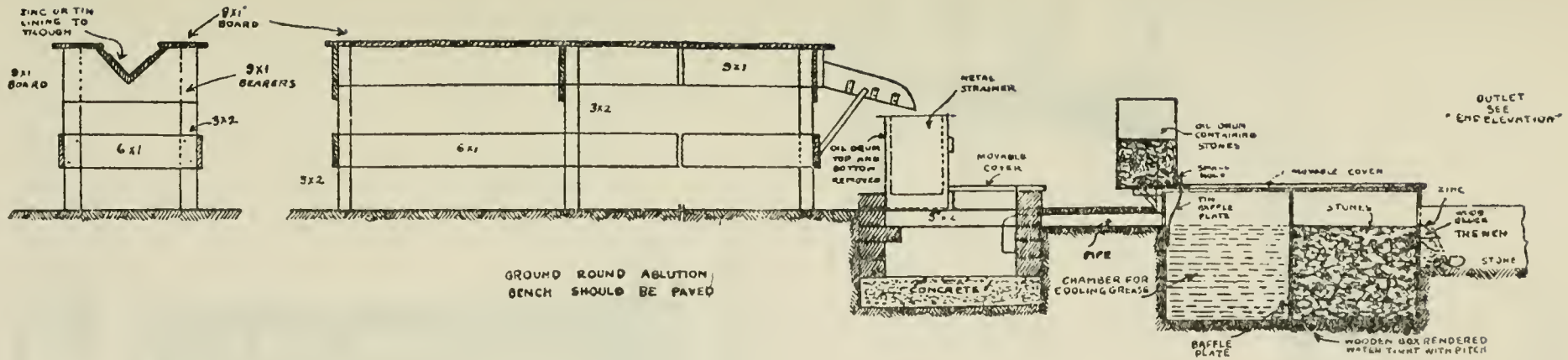

A GREASE RECOVERY TRAP
HOPPER
GREASE BOX
WATER LEVEL
OUTLET
FAT BOARDS
SECTION
ALL SURFACES INSIDE BOX TO BE LINED SO AS TO HOLD WATER
GREASE BOX
TIN BISCUIT BOX
FAT BOARD
OUTLET
PLAN

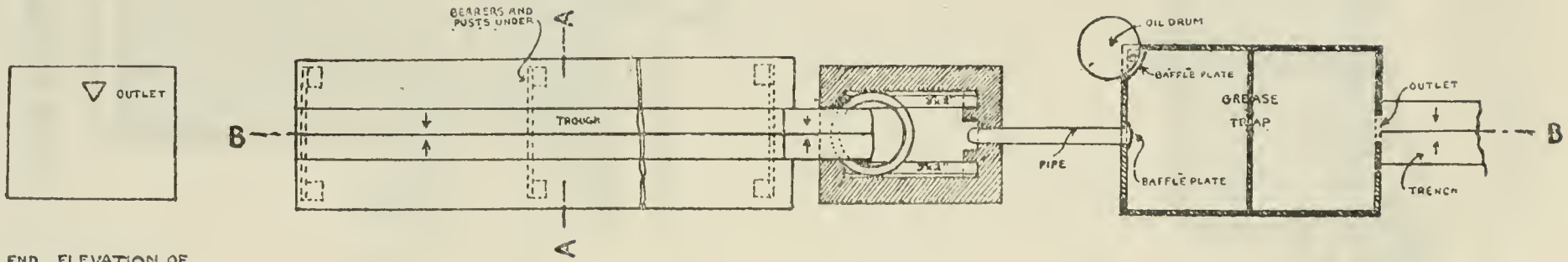
Fig. 17.

FIG. 18.



SECTION AA

SECTION B B



END ELEVATION OF GREASE TRAP SHOWING OUTLET

PLAN

—SCALE OF FEET—

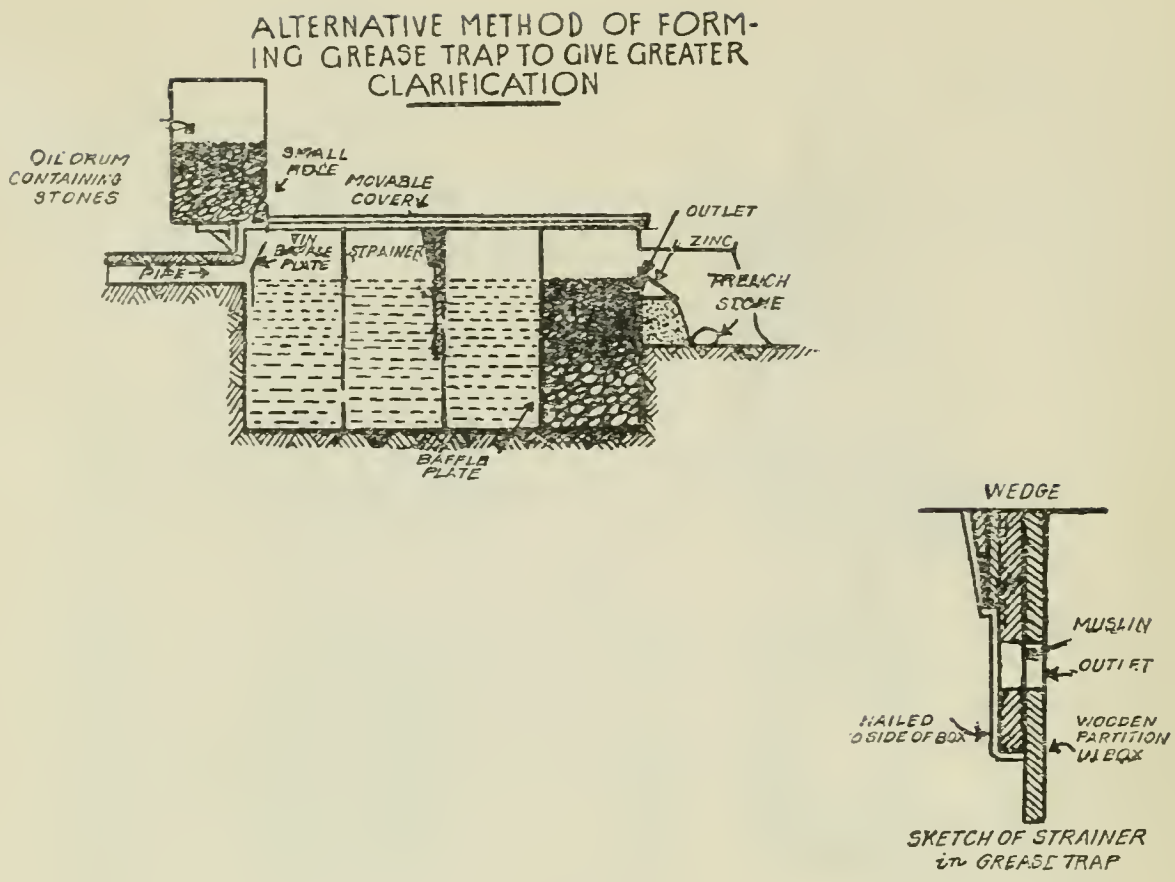


FIG. 19.

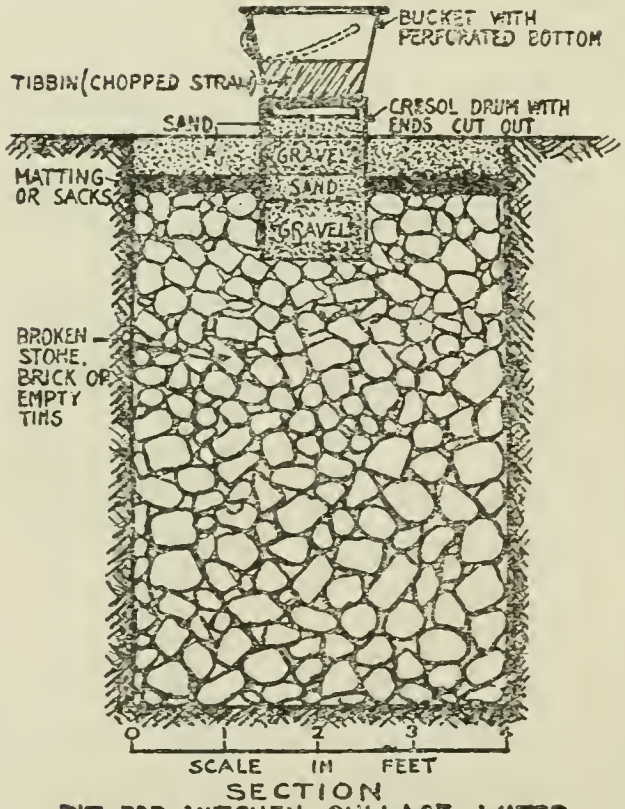


FIG. 20. (After Lelean.)

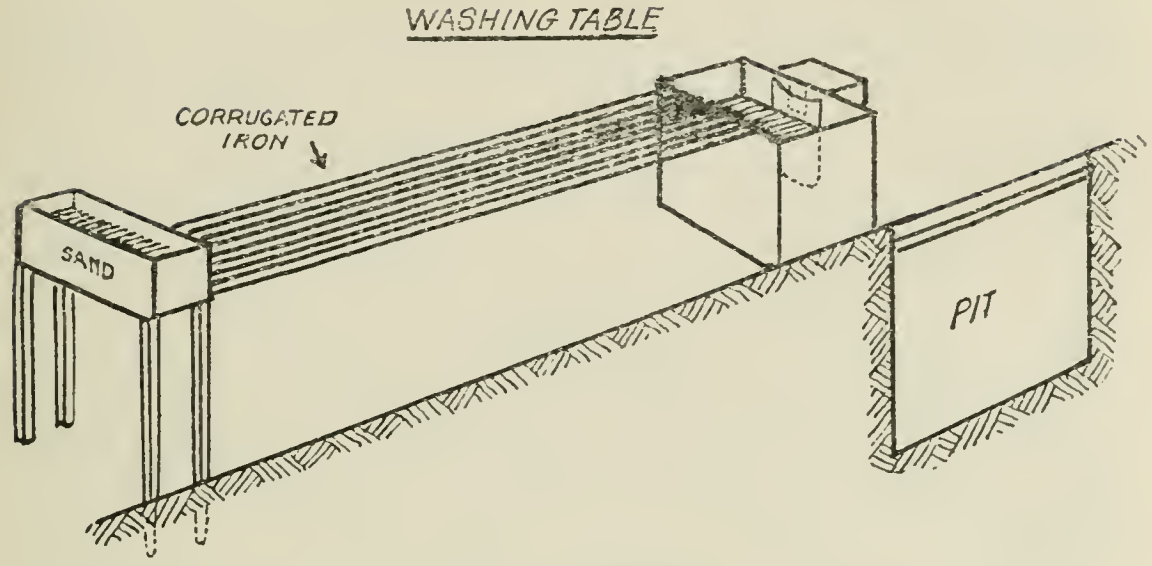


Fig. 21. (After Ellis.)

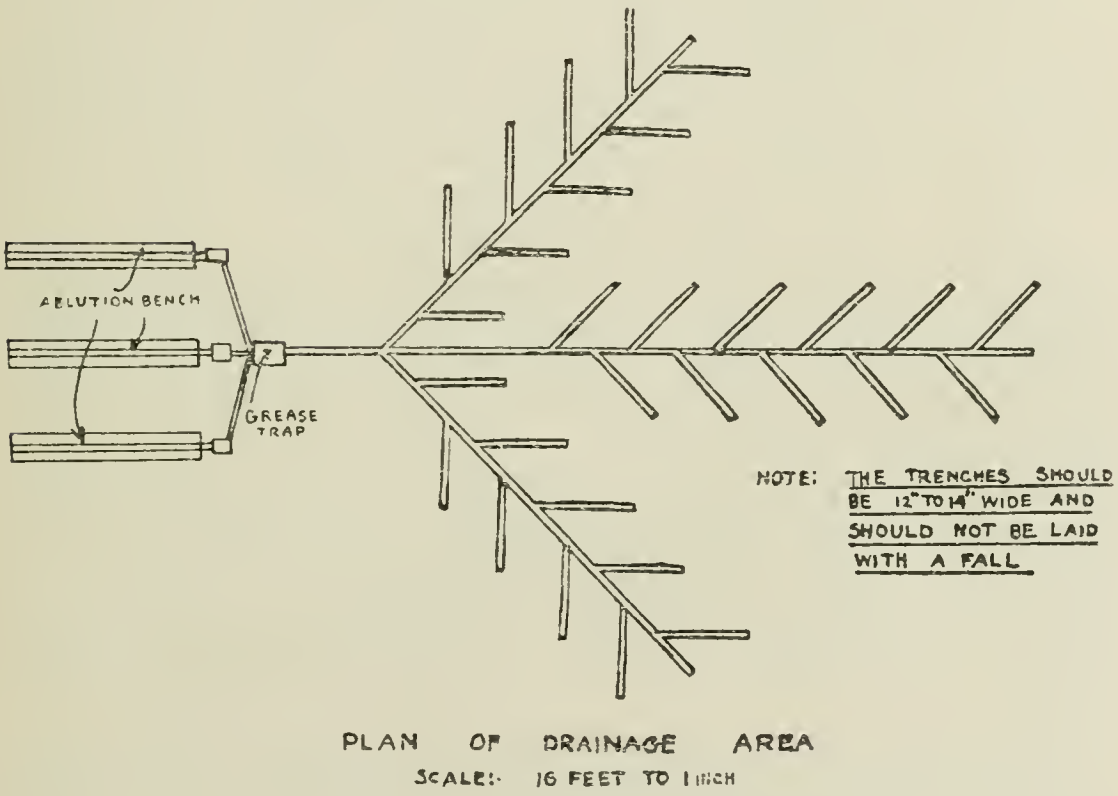

ABLUTION BENCH
GREASE TRAP
NOTE: THE TRENCHES SHOULD BE 12" TO 14" WIDE AND SHOULD NOT BE LAID WITH A FALL
PLAN OF DRAINAGE AREA
SCALE:- 16 FEET TO 1 INCH

Fig. 22.

wash-benches, cook-houses and ablution benches, first through a sieve of perforated corrugated iron, through a trap to remove scum, next through a coke-breeze or sand filter grease-trap, then through

a sedimentation chamber and a second filter, until finally the effluent is passed into either a soakage pit or a sub-soil irrigation trench. It may be led into a system of surface drainage or irrigation where the available ground area is sufficient. (Fig. 22.)

The filter traps are made either of well-tarred wood or of brick set in cement or puddled clay. They are approximately 4 feet long, 3 feet broad, and about 3 feet deep. A partition divides the box into two compartments, one about 3 feet wide and the other a foot wide; this partition reaches to within 6 or 8 inches of the bottom of the chamber, to allow the contents of one compartment to pass to the other. Both compartments are filled to within 6 inches of the top with coke, breeze, or sand. This system is rather complicated and perhaps not more efficient than a well-constructed grease trap.

Soakage Trenches.—Instead of making use of pits, long underground trenches in the looser upper surface of the soil have been used in some localities. These trenches are roofed over with boards or filled with tins and covered with old sacking and earth to the level of the surrounding ground. This may be looked upon as simply an elongated soakage pit, with filtration into the superficial layers of the soil. The absorbing capacity of such a trench, just as with the soakage pit, is reduced if soapy and greasy water is not adequately treated before being allowed to enter it.

There is considerable advantage in keeping the effluent from these systems under ground, particularly in warm weather, and for this reason disposition by soakage pit or covered trench is the method of choice. Intermediate sedimentation or precipitation is an advantage and enhances the ease of final disposition by irrigation or soakage. The addition of 2 grams of chlorinated lime (or one-half gram of crude calcium chloride) to each gallon of waste water acts as a very efficient precipitant. The effluent from the chlorinated water is relatively sterile, provided the chemical is up to standard strength. An alum sedimentation process has been used by Captain Ellis, R. A. M. C., the apparatus being described later.

Soapy water from washing places has a clogging effect on most soils, proving even more disastrous to the efficient working of soakage pits or trenches than greasy water. The scum which accumulates on the surface of hard water in which soap has been used may be removed by passing the water into a box or trap, similar to those used as grease traps. Such a trap is shown in Fig. 23a. The lime soaps which collect and float on the water are skimmed off the sur-

faces of compartments "A" and "B" several times daily, mixed with sawdust, and burned in the incinerator. Finely suspended and colloidal matter is not removable by this device. To rid the water of this, a precipitant like alum must be used. The alum clarifier, shown in Fig. 23b, was devised by Ellis to take care of waste water in a situation where the ground available for absorption was extremely limited, and where a deep well had to be sunk to dispose of the final effluent. His description is as follows:

To avoid the choking of this I considered it worth while to introduce the scheme which is described below. A very much simpler method of adding alum could have been devised, but the main objective was the economy of the reagent. Preliminary quantitative experiments with samples of soapy water from the ablution troughs indicated that about ten grains per gallon of alum was the least quantity that could satisfactorily carry down the colloid. The apparatus constructed required some pieces of 2-inch water

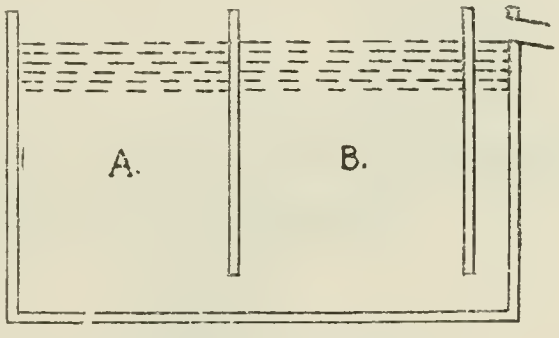


Fig. 23a. (After Ellis.)

piping, otherwise the material employed consisted mainly of easily obtainable articles, such as one or two packing cases and an ordinary square petrol can. This process can be readily followed by reference to Figs. 23a and 23b. The water is first passed through a trap to remove the scum, as previously described. A saturated potash alum solution, containing approximately 10 per cent of the crystalline salt or 5.5 per cent of the dried salt, is introduced into the petrol can through its ordinary stopper opening, which is then screwed down. The diagram shows that this solution cannot get out of the pipe *p* unless water is passing into the mixing box. In this case water will rise in the tube *c*, and, forcing air up the can, will force an equal volume of the solution through the pipe *p*. When this mixing box is full, it automatically syphons out through a trap *D*, which serves on a constant level and ensures the proper working of the syphon. From thence the water passes into a settling pit lined by two barrels. This acts as a sedimentation tank, and the clear water flows away by the pipe *E*. It is preferable to fix a baffle plate in front of this outlet to retain a slight scum which collects on the surface water of this puisard. When the mixing box empties, air is sucked through *p* equal to the volume of the fall of water in pipe *c*. The S-shape of *p* is essential, and it should be as short as possible.

It should be noted that the mixing box is made of such a size that its

capacity is the volume requiring the amount of alum delivered by the length of pipe equal to the water depth in the box. It is more easy to make a box suitable to accompany an odd piece of piping than to obtain pipe of a particular bore. This particular method of delivering an exact amount of

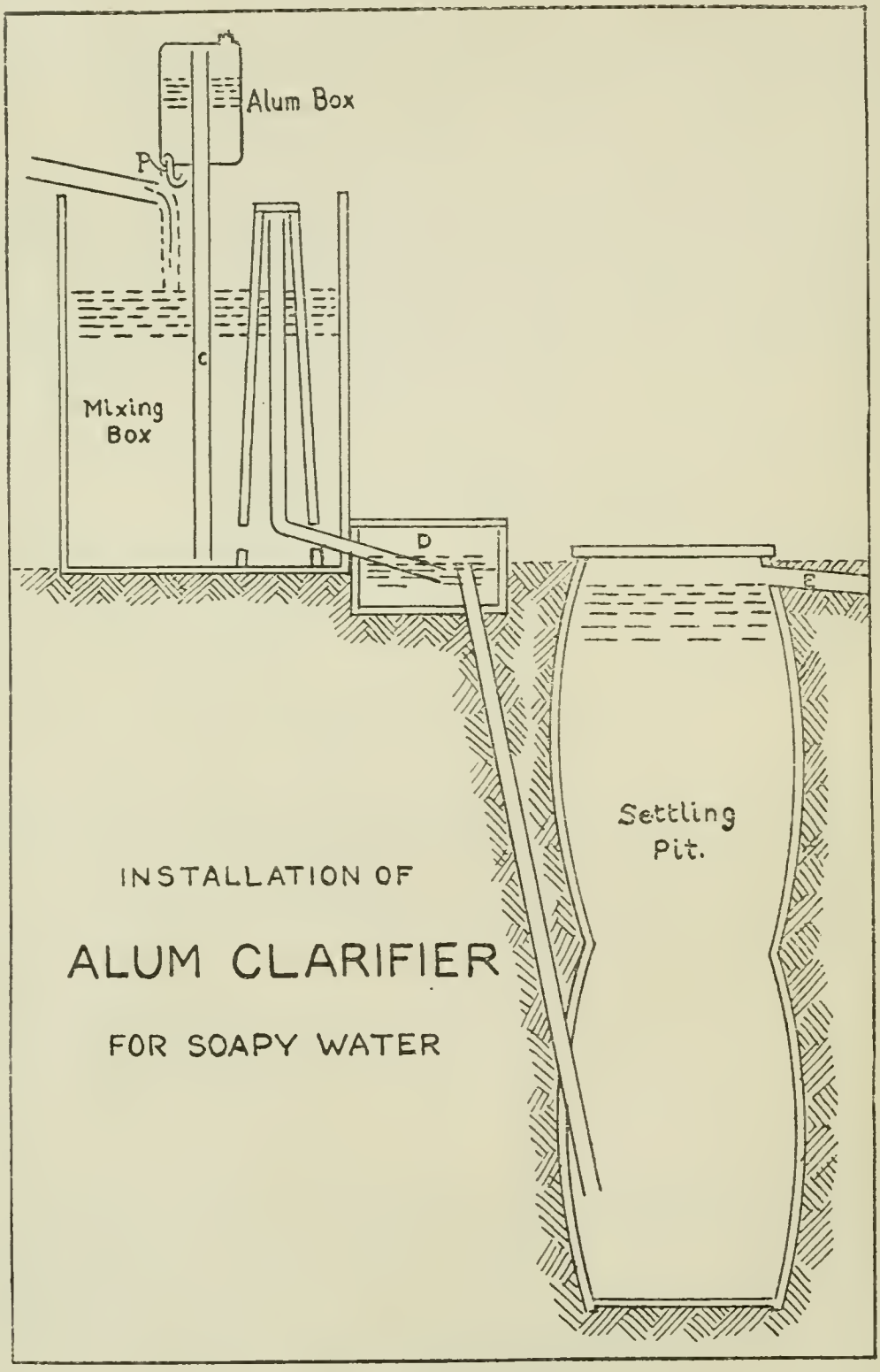


Fig. 23b. (After Ellis)

alum requires the mechanical filling and emptying of the box, an action most conveniently carried out by means of a syphon.

The bell syphon was constructed of wood with an inner iron pipe. The wood is well tarred and preferably coated with pitch. Such a scheme has been working with little attention for some time. A drawback is the clogging of the pipes with soap. They have to be cleaned occasionally with a large test-tube brush mounted on an iron rod or cane.

Surface irrigation or sub-soil irrigation can be used as adjuncts to the soakage pit, but have the disadvantage of requiring comparatively large areas of ground for efficient operation. If, however, they are to be used in combination with a filtration or sedimentation process, or to take the overflow from a soakage pit, not so much ground area is necessary as where surface or sub-surface disposal is the sole method employed.

(*To be continued*)

SOME OBSERVATIONS ON ACUTE CEREBROSPINAL SYPHILIS AND ITS TREATMENT[1]

By Major GUY L. QUALLS
Medical Corps, United States Army

IT IS well known that the exciting cause of all syphilis and syphilitic manifestations, whether primary, secondary, tertiary, latent, or the so-called parasyphilitic diseases, clinically called tabes and paresis, is infection by the spirocheta pallida, although at one time there was some doubt as to the rôle of spirocheta pallida in the nerve lesions or nervous relapses, following the administration of salvarsan. Hoffman[1] has demonstrated its presence in the cerebrospinal fluid of secondary cases by inoculation of the monkey. Nichols and Hough[2] have demonstrated its presence in the cerebrospinal fluid in a case of nervous relapse following salvarsan, by inoculations of the rabbit, thus demonstrating it as the exciting factor in the pathology of such cases.

It has been suggested by some authorities that the contributing factors in acute invasion of the central nervous system are:

1. Strains of a high invasive power, having a special affinity for the central nervous system.
2. Strains resistant to treatment.
3. The destruction of a greater number of parasites in the body outside of the central nervous system and cerebrospinal fluid by salvarsan, and because of the inability to reach them by treatment, or of their resistance to drugs, they remain. This sudden withdrawal of inhibition gives the remaining or resistant organism a chance for rapid multiplication and development in the cerebrospinal system.

For a fuller understanding of my remarks, the following is quoted from the summary of Nichol's article on "Observations on the Pathology of Syphilis."[3]

1. In syphilis the spirocheta localize during the early septicemia and probably do not localize during the later stages.

2. All strains probably localize differently in certain organs. In addition, certain strains probably have an especial localizing power.

(*a*) Various strains of spirocheta pallida exist which differ in pathogenic properties.

(*b*) These strains are probably permanent variations.

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* Read before the Medical Association, Isthmian Canal Zone.
[1] Hoffman, *Dermat Ltschr*, 1916, xiii, 566. Quoted by Nichols, *J. A. M. A.*, Vol. lxiii, 466.
[2] *J. A. M. A.*, January 11, 1913, page 108.
[3] Nichols, *J. A. M. A.*, Vol. lxiii, page 468

(*c*) A strain isolated from the nervous system has shown marked power of generalization in the rabbit.

3. An active lesion in one part of the body tends to inhibit the development of potential lesions in other parts of the body.

The following cases are similar in some respects to those which I propose to report. Sachs[4] in his chapter on tabes, in Osler's "Modern Medicine," states that—

> Only now and then, as in the recent case, is the ataxia developed with startling rapidity. A gentleman, aged 40 years, a lawyer, who has attended to his work without any difficulty, had been able to stand in court and stand on his feet all day long, suddenly found himself beginning to sway, and in twenty-four hours was markedly ataxic. Of course the pupillary symptoms and the loss of deep reflexes had preceded the onset of the symptoms, but of these latter the patient was not aware.

The progress and treatment of this case is not recorded. Osler,[5] speaking of tabes, states that—

> in a case under my care, the gait was characteristic, and Romberg's symptom was present. The knee jerk, however, was retained and there were no ocular symptoms. The condition had developed within three months and there was a well-marked history of syphilis. Under large doses of potassium iodide the ataxia and other symptoms disappeared.

In the light of our present knowledge, it would appear that practically all cases of syphilitic involvement of the central nervous system are acute, as it has been shown by Wile and Stokes[6] that 60 to 70 per cent of all syphilitics, in the secondary stage, show signs of infection of the central nervous system in varying degrees, and it has been previously stated that spirochaetae localize during the early secondaries. Wile and Stokes, in a later article, state "that the nervous system may be and probably is, frequently involved before there are other evidence of hematogenous spread of the treponema pallidum from the site of the initial sore."

Case I. Sergeant S. A. W. White, aged 35 years. Family history, negative. Past history; measles and diphtheria in childhood; recovery complete; gonorrhea eighteen years ago, without complications. Present illness: Patient entered battalion infirmary on June 26, 1914, with small ulceration of *corona penis*. Patient admitted intercourse ten days previously to its appearance. The ulcer healed in four days without complications. As it was the custom to do routine blood Wassermann tests on all cases of suspected syphilis, it was done about four

[4] B. Sachs, Osler's "Modern Medicine," Vol. 8, page 700, 1910.
[5] Osler, "Practice of Medicine," Eighth Edition, page 919.
[6] Wile & Stokes, *Journal Cutaneous Diseases,* September, 1914, page 607.

days after its appearance. The ulcer healed in four days with the time being too short from appearance of last sore for such marked reaction, further inquiry and examination revealed the fact that he had had a sore on penis fourteen years before, at which time it was complicated with bilateral, suppurative buboes without other evidences of syphilis. Anti-syphilitic treatment had not been administered in any form. Patient was transferred to field hospital No. 5, August 12, 1914, for administration of salvarsan. The supply of salvarsan at that time was limited, as no other evidences of syphilis were found after a careful examination, the patient was given one grain of mercury salicylate by intramuscular injection and two days later requested discharge, stating that he felt perfectly well and did not believe he had syphilis. Mercury salicylate injections were continued, one grain per week for four weeks, and discontinued on account of severe stomatitis. Potassium iodide, five grains three times a day, was then given for one month. On September 28, 1914, twenty-six days after mercury had been discontinued, the blood Wassermann was negative, at which time no manifestations of syphilis were noted.

Acute Cerebrospinal Involvement.—On October 9, 1914, while on a practice march, carrying full equipment (about forty pounds in addition to clothing), he fell out of column. The distance covered on that date before onset of symptoms was 15 miles in about five hours. On the previous day he had marched a distance of 22 miles, during which time it had rained, soaking his packs and clothing, thus increasing the load carried. The onset was sudden, with severe pains in chest, severe and persistent headaches, numbness of legs, and sense of constriction about waist. In a short time the legs were so numb and weak that walking was impossible and patient fell out of column.

Examination showed temperature 102°, which remained so for two days; pupils narrow, sluggish to light, knee jerks absent, even upon reinforcement, Romberg's sign present.

Upon entering the field hospital four days after onset the following condition was noted: vomiting, which had persisted to some extent from onset; pupils sluggish to light and accommodation, right dilated and irregular; loss of patellar and Achilles reflexes even upon reinforcement; marked delay in sensation and partial anesthesia below knees; Romberg's sign marked; unable to stand by aid of cane on account of ataxia. Incontinence of urine; temperature 99°; blood serum Wassermann negative; luetin test pustular in seven days. Spinal fluid, pressure increased; cell count, 515 per c. mm. Wassermann 0.2 c.c. double plus, 0.3 c.c. double plus. Noguchi butyric acid test triple plus.

Treatment.—On the day following intraspinal puncture 0.9 gram neosalvarsan was given intravenously, and on the following day about 25 c.c. of spinal fluid withdrawn and 30 c.c. of neosalvarsanized serum injected by gravity. The cell count at time of injection was 500 per

c. mm., the other spinal fluid findings remained the same as those of the previous day. Nine days later the treatment was repeated, withdrawing about 30 c.c. of spinal fluid and introducing 58 c.c. of serum. The spinal fluid at time of second injection of serum shows cell count of 38 per c. mm., Wassermann 0.2 c.c. plus minus, 0.3 c.c. plus minus, butyric acid test plus. Five days later the process was repeated with 55 c.c. of neosalvarsanized serum, the spinal fluid showing cell count 44, Wassermann 0.2 c.c. plus minus, plus minus, 0.3 c.c. plus minus, butyric acid test plus. The fourth and fifth injections followed at intervals of ten days; 58 c.c. of serum was introduced by the fourth and 40 c.c. by the fifth injection.

At no time was there marked depression or reaction upon giving these large doses of serum. During the eighty-two days treatment in hospital, potassium iodide and mercury by inunction were given to the limit of tolerance in conjunction with injections of neosalvarsan and neosalvarsanized serum.

Improvement in nervous and general condition soon commenced; two days after the second intraspinal injection the patient was able to walk about the hospital by the aid of a cane and attend to his personal wants. Control of vesical sphincter perfect; at times, however, complained of a desire to urinate frequently. Left patellar reflex returned upon reinforcement; Achilles absent. Improvement in gait marked, taking into consideration patient's inability to stand up at time of entering hospital. Romberg slight, ataxia moderate, patellar and Achilles jerks present. Pupillary reaction apparently normal. Sensation delayed below knees. Patient was free from pain and discomfort; gained considerably in weight, apparently in good physical condition, and requests return to duty. The spinal fluid findings were not normal and, fearing relapse, patient was kept in hospital under treatment until January 1, 1915. The entire time in hospital was eighty days, the latter part of which patient walked distances from 2 to 3 miles at frequent intervals.

Four months later the following condition was found: Sensation not disturbed. Pupils react to light and accommodation, regular in outline and equal. Patellar and tendo Achilles reflexes absent. Muscle tone normal. Gait good. Romberg sign moderate; very slight ataxia. Soldier states that he stood perfectly still at inspection, in complete equipment, for forty minutes and has done full duty since leaving hospital. Urinates about ten times a day and has complete control of sphincters. Does not have to get up at night to urinate. He recently made a practice march of 27 miles in one day and finished in good condition.

Five months after discharge the blood Wassermann was negative. Spinal-fluid Wassermann, and butyric acid test, negative. Cell count spinal-fluid normal.

Case 2. H. S. J. General prisoner, age 23 years. Family history: Negative. Past history: Measles and whooping cough during childhood. Sore on penis eleven months ago, appearing a few days after intercourse, and healing in three days. No secondary manifestations. Present illness: Patient walked to sick-call October 30, 1914, complaining of hoarseness; could not speak above a whisper. Upon examination, adenoids and hypertrophied tonsils were found, and removed the following day under general anesthesia.

The day following operation patient was still hoarse, and complained of numbness from neck to feet and incontinence of urine and feces. Physical examination the following day showed marked ataxia, partial paralysis of palatal muscles; meningitis, involving the 3rd, 4th, 5th, 6th and 7th cranial nerves, resulting in partial iridoplegia, paralysis of extrinsic muscles of eyeball, ptosis of both lids, moderate exophthalmos and bilateral facial paralysis. Pupils were sluggish to light accommodation, more marked on left side. His temperature reached 99°, remaining so for a few days. There was decreased activity of wrist reflex, loss of patellar and Achilles reflexes and marked Romberg's sign. Luetin test was positive, the so-called torpid form, the reaction occurring twenty days after administration and twenty-three days after beginning treatment. Blood Wassermann was negative on November 2, 1914; three days after admission to hospital, spinal fluid showed moderate increase of pressure, cell count 2 per c. mm.; butyric acid test plus. Wassermann 0.2 c.c. and 0.3 c.c. negative. Although the blood serum and spinal fluid were negative for syphilis, except increased globulins in the spinal fluid, the patient's condition gradually grew worse, active anti-syphilitic treatment was commenced as it was thought at the time that the infection might be of such a virulent nature as to render reaction impossible on the part of the tissues involved.

Treatment.—On the fourth day after admission 0.9 gram neosalvarsan was given intravenously, and on the following day about 30 c.c. of spinal fluid was withdrawn and 58 c.c. of serum introduced into the spinal canal. The tests mentioned above were applied to the spinal fluid withdrawn, previous to introduction of neosalvarsanized serum, and they showed that it remained practically the same as on the previous day. Five days later 0.9 gram neosalvarsan was administered intravenously and 55 c.c. of serum intraspinally, and five days later 45 c.c. of a pooled serum was given intraspinally. Eleven days following the administration of pooled serum, 0.9 gram neosalvarsan and 50 c.c. of serum were given intraspinally. Mercury by inunction and potassium iodide were administered to the limit of tolerance in conjunction with neosalvarsan.

The spinal-fluid findings during treatment remained unchanged, except an increase in the cell count from 2 to 29 per c. mm.

Improvement soon followed in nervous and general condition. Three days after first intraspinal injection, patient was able to move eyeballs to a slight degree. During the time between the second and third intraspinal treatment, ataxia and Romberg began to disappear. Patient began to walk easily without support, and control of sphincter returned. Eyeballs, eyelids, and muscles of face showed about one-half normal mobility. Five days after the last intraspinal injection, ataxia and Romberg improved and movements in facial muscles were apparently normal. Patellar and Achilles reflexes returned upon reinforcement. Seventeen days after last neosalvarsan treatment, both patellar and Achilles reflexes were present without reinforcement, slight ataxia and limitations of eye movements remain. Later there was internal strabismus, left eye, with double vision which persisted for several days.

Two months after beginning treatment, the patient was without ataxia or Romberg's sign, but had slight internal strabismus, left eye. Both patellar and Achilles reflexes are present, more marked on left side. Patient requested his discharge, which was granted him.

Five months after return to duty, examination shows the following: Sensation not disturbed; blood Wassermann, negative. Eye movements normal. Pupils regular and equal, react to light, but not to accommodation. Speech normal. Patellar and tendo Achilles reflexes absent. No paralysis of muscles. Romberg's sign absent. No ataxia. Soldier has gained in weight, feels well, and physical condition is excellent. During the five months his work has been that of a general prisoner in the army, which at times is arduous, consisting for a considerable time of digging drainage ditches. At the time of examination he was soon to be discharged and refused spinal puncture.

Case 3. C. H. S. Private, Company "M," 27th Infantry, aged 22. Family history, negative. Past history: Ordinary disease of childhood with complete recovery. Present illness: On August 10, 1914, sore on dorsal surface of foreskin and glans, followed in September 17, 1914, by marked enlargement of inguinal glands; mucous patches on lower lip and marked anemia with double plus Wassermann reaction. There was no clinical evidence at the time of involvement of the central nervous system. Luetin was positive, papular, mild, during the early secondary manifestations. On account of scarcity of neosalvarsan and salvarsan, it was not administered upon admission. One grain of mercury salicylate was given by intramuscular method. Five days later a divided dose of neosalvarsan was given a child and the remainder 0.045 gram was given patient by intravenous method. One week later he was discharged from hospital improved. Mucous patches healed and enlarged glands were rapidly diminishing with marked improvement in general condition. Patient was then separated from his command, sent on detached service in a military tournament, and treatment discontinued.

Acute Cerebrospinal Involvement.—Commenced twenty-four days after treatment was discontinued, with severe headaches, general muscular and arthritis pains. He was admitted to hospital the next day, with the following findings: Pupils unequal and irregular; react to light sluggishly. Retroaction of neck; general hyperesthesia; marked ataxia and Romberg; Kernig sign present; with bilateral Babinski and ankle clonus. Moderate general lymphadenopathy. Blood Wassermann double plus.

A diagnostic lumbar puncture was performed immediately and 20 c.c. fluid removed with finding as follows: Pressure increased. Fluid cloudy. Cell count, 1,100. Butyric acid test double plus. Wassermann double plus, 2 c.c. and 3 c.c.

The spinal fluid shows a few polymorphonuclear leucocytes, the remainder are lymphocytes and unidentified cells. Centrifuged specimens gave a moderate amount of sediment. Smears were negative for microörganisms. Cultures on blood serum and blood agar remain sterile after incubation of four days.

Treatment of Cerebrospinal Involvement.—Six-tenths gram of neosalvarsan was given immediately, after smears were found negative for microörganisms, followed by 0.9 gram every week for four weeks. In addition to neosalvarsan, mercury by inunction daily and mercury salicylate by intramuscular method was given to the limit of tolerance.

Improvement followed lumbar puncture immediately, the headache disappeared entirely. At the time of the last intravenous administration of neosalvarsan all pathological symptoms in the nervous system had disappeared, except hyperactive patellar and Achilles reflexes. At that time patient requested to go to duty, he was in good physical condition and objected to spinal puncture.

I left the hospital before his discharge and have been unable to obtain further information regarding him.

Case No. 4. Private C. K., Troop "M," 6th Cavalry, aged 40. Family history: No relation to present trouble. Past history: Sore on foreskin of penis, November 8, 1913, followed in three and one-half months by macular eruption over entire trunk and plus Wassermann reaction.

Patient was admitted to hospital with above findings, and received two intravenous injections of 0.9 gram neosalvarsan, one week apart. After the cutaneous eruption had disappeared, patient was discharged from the hospital and for six months was given weekly inunctions of mercury, 6 grams each and protiodid of mercury tablets, one-sixth grain each, 2, three times a day for two weeks.

Cerebrospinal Involvement.—While on weekly inunctions of mercury patient suddenly began to have delusions of persecution, became easily excited and nervous and was accused of cocainism. He was observed for about one week in the regimental hospital and was then sent to the field hospital for observation of his mental condition. Upon

entrance to hospital, he was excitable and nervous. Sleep was much disturbed and there was marked hyperesthesia. There was partial loss of hearing, left ear; tinnitus aurium, right; loss of memory for recent events; delusions of persecution, headache localized in right supraorbital region; tremors of facial muscles; partial paralysis left facial nerve; exaggerated right patellar and Achilles reflexes; contracted and irregular pupils, sluggish to light; moderate ataxia and Romberg. Blood Wassermann plus; spinal fluid pressure slightly increased, cell count 50; butyric acid test positive. The spinal fluid was lost before reaching the laboratory and Wassermann was not made. The luetin test was positive, papulo-vesicular form.

Treatment.—Five weekly intravenous injections of neosalvarsan, with mercury by inunction and salicylate of mercury intramuscular to the limit of tolerance, potassium iodide, saturated solution, ten drops three times a day, increased one drop daily to physiological limit. At the end of this time his mental symptoms and nervous findings improved very little, except disappearance of headache. It was then decided to try an intraspinal injection of neosalvarsanized serum and following an intravenous injection of 0.9 gram neosalvarsan, 30 c.c. of neosalvarsanized serum was introduced intraspinally. Improvement followed, and in about ten days delusions disappeared; sleep became normal; there was marked improvement in pupillary reactions and facial paralysis. Patient then requested his discharge and did full duty for two months. He was then re-admitted upon his own request for another administration of serum, stating that he feared return of previous conditions. Mixed treatment was continued between first and second admissions.

Examination on readmission shows some contraction and irregularity of pupils, with sluggish reaction to light with exaggerated right patellar and Achilles reflexes. Other nervous symptoms had apparently disappeared. Blood serum Wassermann, negative. Cerebrospinal fluid gave the following results: Wassermann negative, 0.2 c.c., 0.3 c.c.; butyric acid test plus; cell count, 18 per c. mm.

The only discomfort following intraspinal administration was moderate headache of short duration.

Patient returned to duty in a few days, and when last heard from, two months later, was in excellent physical condition, doing full duty with a troop of cavalry.

Case 5. J. W. M., Private, Company "M," 2nd Battalion Engineers, aged 25. Family history negative. Past history negative. Present illness: Sore on glans penis, dorsal surface, August 1, 1913, followed by slight general lymphadenopathy and double plus Wassermann, August 28, 1913.

Admitted to hospital August 30 and 0.9 gram of neosalvarsan given intravenously. He was then discharged, the syphilitic register was

misplaced, and a change of surgeons occurred in the battalion in which the soldier was serving; consequently treatment was stopped until soldier again reported sick.

Cerebrospinal Involvement.—Patient again reported sick one and one-half months after first dose of 0.9 gram of neosalvarsan, complaining of headaches, double vision, sores in mouth and inability to move right upper eyelid. According to patient's statement all his symptoms developed in three days.

Physical examination showed moderate general lymphadenopathy, mucous patches in mouth, meningitis involving the 3rd, 4th, 5th, 6th and 7th nerves, bilateral, resulting in diplopia ptosis of left upper eyelid, partial iridoplegia, with unequal and sluggish and somewhat irregular pupils. Moderate ataxia and Romberg sign present; with exaggerated patellar and Achilles reflexes, and bilateral Babinski sign. Patient has some mental symptoms, and thought retarded. Temperature 103°, which persisted for a considerable period. Blood Wassermann double plus, the spinal fluid was not examined.

Treatment.—Six intravenous injections of 0.9 gram neosalvarsan every ten days for sixty days, supplemented with mercury by inunction and intramuscular injections of salicylate of mercury, to the limit of tolerance. Potassium iodide, 20 grains three times a day, was given for thirty-five days of this period. Mercury by inunction and intramuscular injections were then continued for twenty-two days, and at the end of eighty-three days after entrance to hospital the following notation was made on the syphilitic register: "Temperature normal. Ataxia disappearing. No diplopia or headache. Left eyelid, moderate movement. Facial paralysis slowly disappearing. Partial iridoplegia remains. Gain in weight 20 pounds." The spinal fluid was not examined. Patient returned to duty with command. Treatment was continued for several months with mercury salicylate by intramuscular injection, one grain per week, together with mercury inunction and potassium iodide to the limit of tolerance. During this time he was admitted to hospital twice; once, after an epileptiform convulsion; and in addition was given two intravenous injections of 0.9 gram of neosalvarsan upon each admission. Eleven intravenous injections of neosalvarsan 0.9 gram each were given during the entire course of treatment. At the end of seven months, treatment was discontinued for one month and patient sent to hospital for examination and spinal puncture. The following were the findings at that time: Luetin tests plus, papular reaction mild; Wasserman blood serum double plus; cerebrospinal fluid showed 200 cells per c. mm.; Wassermann reaction negative; butyric acid test double plus. Physical examination showed partial paralysis, left upper eyelid; left pupil slightly dilated; both pupils sluggish to light and accommodation; moderate exaggeration patellar

and Achilles reflexes; slight ataxia; thought apparently retarded; partial paralysis of muscles supplied by facial nerves. Physical condition otherwise good and patient had gained in weight. He objected to intraspinal medication. Our supply of neosalvarsan was nearly exhausted, and considering the slow improvement by its introduction, patient was sent to duty, and mercury and iodides continued.

After each return to duty, his company commander stated that he was slow to think and act, and at times showed awkwardness of movement in executing commands.

This patient arrived on the Canal Zone in May, 1915, with his command, Company M. Engineers, and was discharged in June, 1915. I was unable to examine him during his stay or obtain a record of treatment since his last return to duty. The records of the Board of Health Laboratory at Ancon, C. Z., show a positive blood Wassermann, June 2, 1915, twenty and one-half months after acute cerebrospinal involvement.

The intraspinal medication in the cases herein reported was done by me while on duty at Field Hospital No. 5 during the latter part of 1914, at Texas City, Texas, and some of the data were taken from syphilitic registers and include the observations made and treatment administered by the staff of Field Hospitals 3 and 5 and other medical officers on duty at the regimental infirmaries attached to the 2nd Division, U. S. Army. The Wassermann reactions were made at the base laboratory, Fort Sam Houston, Texas; the other laboratory tests and serum preparations were made by me in a field laboratory at Field Hospital No. 5. The blood serum for intraspinal injection was withdrawn by vein puncture into glass-stoppered bottles and allowed to coagulate. The clear serum was then pipetted off, mixed with normal saline solution in such amount as to make a 40 per cent dilution of serum. It was then heated to 56° C. for one-half hour, and introduced after cooling to body temperature intraspinally, very slowly, by gravity.

The apparatus used consisted simply of the barrel of an antimeningococcus serum syringe, or a small tunnel connected to the needle by a rubber tube 14 inches long. The pressure exerted by such a column is not great, and by introducing the serum very slowly large doses were administered without untoward symptoms. The pressure was easily increased or diminished by elevating or lowering the container.

SUMMARY

1. The nervous relapse following cessation of salvarsan treatment accounts for the acute cerebrospinal involvement in cases 3, 4,

and 5, while a nervous relapse following cessation of mercury may account for the rapid invasion of the cerebrospinal axis in Case 1 as mercury had been discontinued in this case for one month because of severe stomatitis and small doses of potassium iodide were given.

2. In Case 4 it would appear that the mercurial inunctions should have been given at more frequent intervals.

3. In Case 2 a rapid involvement of the central nervous system could be accounted for by an organism of high invasive power; the diagnosis, however, is in doubt, yet I have never seen a case showing such a marked reaction to luetin in which syphilis could be excluded. From the spinal fluid findings alone it might have been diagnosed poliomyelitis; however, the positive luetin, the marked involvement of the posterior roots of the cord, with involvement of the sphincter without paralysis of muscles in the lower extremities, and the rapid improvement of all paralysis and symptoms upon administration of anti-syphilitic treatment, would place it as a case of acute cerebrospinal syphilis, and should a similar case present itself, the same treatment would be carried out.

The cases in this series in which intraspinal medication was employed seem to have improved more rapidly and improvement was apparently more permanent than in those receiving neosalvarsan only.

It is believed that the administration of mercury to its limit of tolerance, in conjunction with intravenous and intraspinal medication of salvarsan, is a potent factor for good.

By employment of the proper technique the amount of serum given intraspinally may be materially increased without depression or serious after effects, and it is believed with more rapid improvement.

In Case 3, the onset and manifestations were of such an acute character that the case could have been easily mistaken for an acute meningitis due to the meningococcus had it not been for the laboratory findings.

THE ACTIVITIES OF THE UNITED STATES PUBLIC HEALTH SERVICE IN EXTRA-CANTONMENT ZONES, WITH SPECIAL REFERENCE TO THE VENEREAL DISEASE PROBLEM[1]

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THE United States Public Health Service, as a part of its war functions, has taken charge of health activities in the extra-cantonment zones. On account of the common difficulties of lack of coördinative authority, stress of business activities, and the limited funds of local communities, each zone has presented its own special problem. It will be the purpose of this paper to touch briefly on what has been accomplished in sanitation in the area surrounding Chickamauga Park. However, special stress will be given to the national program for combating venereal diseases by citing the results accomplished in this local zone.

The district surrounding Chickamauga Park is of special importance in that it comprises two states, three counties and a city at present so congested as to throw the existing local health organizations out of equilibrium. The area comprises about 225 square miles and has a normal population of about 105,000. The community now represents about twice that number, in addition to the vast number of troops stationed in the park, the greater percentage of which mingles daily with the civilian population. The local health administration was inadequate for the stress of the intensive military and civilian activities of the district, which was crowded at first with workmen and then with troops, but the state and local authorities were willing to delegate their powers to the officers of the U. S. P. H. S. and to coöperate with them. If brief, the general plan adopted was that a Public Health Service officer would assume charge of sanitation and coördinate all local departments. These local departments were supplemented by a Public Health Service sanitary organization and by a sanitary unit of the American Red Cross. It was necessary to study in some detail the health admin-

[1] Read at the annual meeting of The Association of Military Surgeons, held at Camp Greenleaf, Fort Oglethorpe, Ga., October 14, 15, 16, 1918.

istration of the city and counties in order intelligently to formulate plans of carrying on one central health organization for the zone.

PLAN OF OPERATION

In order to concentrate on essentials, it was decided to limit the zone work to the control of communicable diseases, including malaria and venereal diseases; to the proper disposal of excreta; to safeguarding the supply of milk and water; to inspection of schools; and to the sanitary control of all establishments selling food and drink, and public places such as moving picture halls, barber shops, pool rooms, etc. The matter of garbage disposal, abatement of nuisances, and inspection of dwellings and stores was left entirely in the hands of the municipal health authorities, but in rural communities and small towns this matter was kept under the control of the Public Health Service, assisted by the town authorities.

The organization in this zone is as follows: By agreement with the local authorities, an officer of the Public Health Service was detailed in the capacity of full-time health officer for city and county, and as director of sanitation. By special arrangement, all health functions, whether municipal or county, are administered through the central office. This enlarged department is arranged into divisions:

(*a*) *Division of Communicable Disease.*—This division is in charge of an officer who devotes full time to this work and is assisted by a corps of public health nurses and inspectors. Since the first essential for control is the prompt recognition and reporting of communicable disease, all physicians in the zone are asked to report to this division all cases that are in fact or are suspected to be communicable. The reports are received by mail or telephone and the epidemiology of the most important diseases are immediately studied. Contacts are examined and proper measures are taken to isolate carriers and those in the incubation stage. Assistance in diagnosis is given to physicians when requested and the central laboratory gives aid in every way possible. When requested to do so, the medical officer visits the case to confirm diagnosis, to get epidemiological data, and to establish quarantine. The Public Health Service nurses follow up the case as soon as possible.

The control of the ordinary contagious diseases has heretofore been largely in the hands of the practising physician; at his request the cases were placarded, and on his notification the placard was removed. Control of these diseases is now entirely in the hands of

the officer, and it is believed that the present system more adequately prevents the spread of contagious diseases.

(*b*) *The Laboratory.*—A fully equipped public health laboratory is absolutely essential for the proper control of disease. Therefore the existing laboratory of the Health Department of Chattanooga was greatly enlarged in equipment and personnel. All the work for the practicing physicians in the community is done free of charge. Besides the routine investigations of clinical cases the water and milk supply of the zone is regularly examined.

(*c*) *Division of Housing and Sanitation.*—This division is in charge of a federal and local chief sanitary inspector, acting coördinately in that work. Under this division all public places, including food establishments, barber shops, moving picture halls, billiard parlors, etc., are regularly inspected for the enforcement of rigid sanitary rules. Through this division all employes have been physically examined.

(*d*) *Milk Investigations.*—The question of milk supply was of great importance to this community, and a special division for milk inspection was created. That the milk supply was not properly guarded was shown by an explosive outbreak of typhoid fever in the summer of 1917. A survey at that time showed that both the dairy farms and the milk depots needed decided improvement in sanitary conditions. The investigations were handled by market milk experts, and competent laboratory control was made with the general surveys. Proper ordinances were passed and enforced to protect the supply. All farms and plants of raw and pasteurized milk, including ice cream, are thoroughly and regularly inspected and must satisfy this office that the milk so produced is not capable of conveying infection. About 75 per cent of the milk now produced in this locality is pasteurized by the latest acceptable methods.

(*e*) *Water Supply.*—The city of Chattanooga, its suburbs and Chickamauga Park are supplied with water from the Tennessee River, which has been adequately protected. This is examined weekly by the laboratory for its bacterial content. The rest of the zone is furnished from private sources such as wells, streams, cisterns, etc. Analyses showed that all these were contaminated with colon bacillus suggestive of sewage contamination. Wherever possible, measures have been instituted to safeguard the water supply.

(*f*) *Rural Sanitation.*—A large area of this zone is strictly rural and a special division of rural sanitation was formed. The functions of this division were to study and correct defects in sew-

age disposal, investigate and correct polluted water supplies, and to inaugurate an educational campaign in order to teach the farmers elementary principles of hygiene and sanitation. House-to-house canvasses were made; a complete survey was made of homes, including a history of previous illness, especially the intestinal diseases; literature or instructions on disease prevention were left and orders were given for the correction of insanitary disposal of excreta, with a time limit for installation. More personal attention must be given to residents in rural districts, for, as a rule, the farmer has in a measure been his own authority in sanitary matters. Instead of giving detailed figures, it is only necessary to state that 90 per cent of the zone has a sanitary method of sewage disposal with a corrected water supply of 80 per cent, and that the incidence of typhoid fever has been reduced to a minimum.

(*g*) *Public Health Nursing Service.*—As a branch of the Division of Communicable Disease, the Public Health Nursing Service was inaugurated. This service is absolutely essential in the education of the general public in the care and treatment of those suffering with preventable disease. The function of this division is investigation of communicable disease, follow-up work, and actual demonstrations in nursing at the bedside in the homes of the indigent. The force is large enough to coöperate with the different divisions of the organization. It has also been engaged in the protection of communities against smallpox and typhoid fever by carrying on an intensive vaccination program. In the case of indigent, disinfectants, medicines and other needed materials are dispensed. The people are educated as far as possible in the prevention of disease spread, and repeated visits are made. Various lectures on health, on the proper care of the home and person, are given at meetings of parent-teachers' and other associations. This service is in charge of a supervising nurse especially trained in public health work.

(*h*) *School Inspection.*—The Public Health Service believes that by competent inspection and education of school children, the rate of communicable disease can be greatly reduced. Therefore, there was established in Chattanooga a school inspection system, in charge of a full-time physician, with a corps of nurses to assist in the examination of children and investigation of all absentees. At the same time, mental and physical defects, when found, were reported to the parents for correction.

(*i*) *Malaria Control.*—Although the incidence of malaria in

this zone was not high, a survey showed that there was abundant breeding of the anopheles mosquito. It was fair to assume that if troops or civilians brought from malaria-infected countries to this camp were carriers of infection, an epidemic of malaria would soon start in this locality. Therefore a complete survey was made by a competent sanitary engineer and malaria control inaugurated. This area consists of about 55 square miles, exclusive of the National Military Park. It extends from the northern limits of East Chattanooga to the southern boundary of the town of Chickamauga, Georgia, and includes all the suburbs of Chattanooga. The aggregate population of the area, exclusive of Chattanooga, is estimated to be about 105,000. Topographical conditions divide this zone into two distinct sections—the Chattanooga valley and the Chickamauga valley. A careful survey of these topographical features readily suggests the best course to pursue in controlling mosquito breeding.

Anti-malaria work in the zone began the last week in May. Control of anopheles breeding was attempted by two methods, *i. e.,* by draining and ditching, and by oiling. This latter method was relied upon as a temporary measure. The area was divided into three zones for convenience of inspection and of the keeping of records, and a field inspector appointed for each zone. His duties were to make a complete survey of the zone, report breeding places of anopheles, collect larvae and adult mosquitoes, inspect drip cans and surpervise in general all field work and oiling. Inspectors were held responsible for progress of all work within their respective zones.

Coöperating with the Army, a malaria survey of Fort Oglethorpe and Chickamaugua Park was undertaken in the first week of June. Arrangements for coöperation with the army medical officers were made and the work was carried out in accordance with definite plans. Malaria posters were furnished for the barracks and a number of Public Health Supplements (No. 18, *Malaria Lessons, Its Cause and Prevention*) were issued to the camp surgeon for distribution. Briefly, the incidence of malaria has been greatly reduced, four cases being reported in the entire zone and only two of these confirmed by laboratory diagnosis.

It will not be possible to give the direct results of intensive sanitation in the scope of this paper, but two important features are brought out:

1. A decided improvement in general sanitary conditions throughout the zone.

2. A marked reduction in the rate of typhoid fever and other intestinal diseases.

During the year, epidemics of two serious diseases have been avoided, *i. e.,* meningitis and smallpox.

(*j*) *Venereal Disease Control.*—I have left the subject of venereal diseases last because the control of these is the largest problem now confronting the Army, the Navy and the Public Health Service. The incidence of venereal disease among the "Selective Draft" is familiar to all. It is known that this infection came essentially from the civilian population. It is also known that it is impossible to reduce any disease to a minimum among the troops so long as we neglect to take the proper precautions to reduce it in the civilian population. From a venereal standpoint it is therefore necessary to include the whole territory of the United States and its possessions as the zone to be controlled. No definite line of a civil sanitary district can be drawn around a camp in this campaign as we have done in our endeavor to control other communicable diseases. To accomplish our results it is not sufficient to inaugurate the campaign merely in the zones around the camp, but such measures must include especially the larger cities and all parts of every state in the Union. According to Assistant Surg. Gen. A. J. McLaughlin:

A successful campaign against these diseases necessitates a complex program.

1. Moral, social, and economic phases in which the health officer can assist, but which are best directed by other agencies.

2. That portion of the suppressive program which is directly under the control and within the powers and duties of the health officer.

There is no part of this program in which the health officer is not interested. He has an obligation to devote his best efforts to securing results, but special activity is desired at this time in that portion of the program directly under his control.

In instituting this nation-wide campaign the Surgeon General of the Public Health Service sent on January 2, 1918, the following telegram to the health officers of all the states:

Control venereal infections in connection prosecution of the war constitutes most important sanitary problem now confronting public health authorities of United States. Plan of control mailed you today. Request your coöperation forceful enforcement same. Venereal infections should be made reportable and quarantinable, means of diagnosis and cure should be provided. Campaign wisely conducted publicly should be launched. Please inform me your action in premises.

Following this telegram a letter was addressed to the state health officers showing the importance of carrying on anti-venereal campaigns in those cities which are outside the extra-cantonment zones

but to which soldiers go in search of recreation. Most important of all, perhaps, is the thorough education of the general public to the end that this disease group will be considered in the same light as are the other communicable infections. Accompanying the letter was a detailed memorandum relative to the control of these diseases. In the Public Health Reports of March 29, 1918, there were suggestions for state boards of health and regulations approved by the Surgeon Generals of the Army, Navy and Public Health Service as most feasible for the control of venereal diseases. As a result of these suggestions, the response to the printed appeal resulted in very large additions to the list of the several states that had previously adopted regulations along the lines indicated.

The interest of the different states has also been stimulated by the offer to aid in the establishment of special divisions for venereal disease. After a conference with the Surgeon General of the Army, the Surgeon General of the Public Health Service telegraphed to the state health officers that the service would appoint an officer in each state to assume charge of venereal control under the direction of the state health officer. This telegram resulted in a large number of acceptances.

EXPLANATION OF THE ORGANIZATION OF THE WORK

Where these bureaus of venereal disease have been established the activities have been grouped under the following heads:

1. Notification of cases of venereal disease to the health authorities.

2. Repressive measures, looking toward isolation and treatment in detention hospitals of infected persons who are unable or unwilling to take measures to prevent their becoming a menace to others; also measures for the suppression of prostitution.

3. Educational measures, including measures for informing the general public as well as infected individuals, in regard to the nature and manner of spread of venereal diseases and the steps that should be taken to combat them.

4. Extension of facilities for early diagnosis and treatment. State to be systematically divided and organized for this purpose with representatives of the division of venereal disease in charge of the work in each area.

By constant efforts on the part of the Surgeon General of the Public Health Service, the Surgeon General of the Army and the Law Enforcement Division of the Commission on Training Camp

Activities, together with other different organizations, the following results have been obtained for a working basis in the control of venereal infection:

1. It became rapidly recognized that health departments must assume their part in the fight of venereal diseases which heretofore has been waged by educational and police organizations.

Acting upon this principle, notification laws or regulations requiring the reporting of these diseases have been passed. Corrected to July 31, six states require reporting of venereal diseases by name:[1] Colorado, Indiana, Maryland, New Jersey, Ohio, Vermont.

Thirty states and Hawaii require reporting by serial number:

Alabama	Iowa	New Mexico	Tennessee
Arizona	Kansas	New York	Texas
Arkansas	Kentucky	Oklahoma	Utah
California	Louisiana	Oregon	Virginia
Connecticut	Massachusetts	Rhode Island	Washington
Florida	Michigan	South Carolina	West Virginia
Georgia	Minnesota	South Dakota	Wisconsin
Illinois	Mississippi		

Twenty require reporting by name when patients failed to observe proper precautions:

Alabama	Illinois	Minnesota	Oregon
Arizona	Iowa	Mississippi	South Carolina
Arkansas	Kansas	New Mexico	Texas
California	Massachusetts	New York	Virginia
Georgia	Michigan	Oklahoma	Washington

2. It is recognized that the principles governing control of venereal disease are essentially the same as those of any other communicable disease. Admitting this principle, the health boards of twenty-seven states have passed regulations whereby persons who are a menace to the public health on account of venereal infection may be isolated until they are no longer a danger to the community:

Alabama	Indiana	Mississippi	South Carolina
Arizona	Iowa	New Jersey	South Dakota
Arkansas	Kansas	New Mexico	Texas
California	Louisiana	New York	Vermont
Colorado	Maryland	Ohio	Washington
Georgia	Michigan	Oklahoma	Wisconsin
Illinois	Minnesota	Oregon	

[1] States making venereal disease notifiable are rapidly increasing. The list as given will undoubtedly be incomplete by the time this article is in press.

Thirteen states have divisions established especially devoted to the control of venereal diseases:

Arkansas	Illinois	Michigan	Ohio
California	Indiana	Minnesota	Pennsylvania
Colorado	Louisiana	New York	Virginia
Georgia			

In twenty-two states arrangements have been made to place an officer of the Public Health Service in charge of the bureaus. These are rapidly being increased:

Alabama	Iowa	Mississippi	Oregon
Arkansas	Kentucky	Missouri	Rhode Island
Colorado	Louisiana	Montana	South Carolina
Florida	Maryland	New Hampshire	Virginia
Georgia	Massachusetts	Ohio	Washington
Indiana	Minnesota		

Thirteen states have already established chains of venereal disease clinics as a part of the machinery in disease control:

Alabama	Indiana	Minnesota	Pennsylvania
California	Massachusetts	Ohio	South Carolina
Connecticut	Michigan	Oregon	Virginia
Georgia			

The Public Health Service, in conjunction with the American Red Cross, has opened clinics in twenty-five extra-cantonment zones:

Alexandria, La.	Des Moines, Iowa	Macon, Ga.
Anniston, Ala.	El Paso, Tex.	Montgomery, Ala.
Atlanta, Ga.	Fort Worth, Tex.	Newport News, Va.
Augusta, Ga.	Greenville, S. C.	Petersburg, Va.
Chattanooga, Tenn.	Hattiesburg, Miss.	Portsmouth, Va.
Charlotte, N. C.	Houston, Tex.	San Antonio, Tex.
Chillicothe, Ohio	Jacksonville, Fla.	Spartanburg, S. C.
Columbia, S. C.	Louisville, Ky.	Waco, Tex.
Leavenworth, Ky.		

The two important measures in which the health officer is directly interested requiring money but no additional legislation are (1) the establishment of free diagnosis facilities, and (2) the establishment of free treatment facilities.

If these are available, thousands of carriers can be diagnosed and treated and made non-infectious without compulsion of any kind. Therefore the fundamental need is that of funds. As a war measure it should be practical to obtain this from state authorities,

as this campaign is a part of a nation-wide patriotic effort to increase the efficiency of the troops.

DIAGNOSTIC FACILITIES

Besides the local municipal laboratory in which provision should be made for the routine examination of specimens for the gonococcus and treponema, a state Wassermann laboratory should be established. By this, due to the greatly increased number of specimens examined, a much lower cost per test and much greater accuracy are secured. A chain of venereal dispensaries with the proper facilities for those cases needing hospitalization should be placed in such a manner as to furnish treatment facilities for the entire state. These clinics should serve as centers for the distribution of arsphenamine and other expensive drugs.

Acting under directions of the Surgeon General the writer held conferences with authorities of the state of Tennessee, going into detail as to the feasibility of making a state-wide campaign for the control of venereal disease and the establishment of venereal clinics in important cities and at strategic points. Owing to lack of funds and other circumstances, up to the present time nothing has been accomplished under the state régime.

LOCAL ACTIVITIES

The local situation presents three phases: (1) the recognized prostitutes, (2) the girl making a lawful living but of known lewd character, (3) the male population infected with venereal disease. In February, 1918, a clinic known as Government Clinic No. 12 was organized as follows:

The Public Health Service agreed to furnish a full-time specialist and the necessary arsphenamine. The American Red Cross agreed to furnish nursing service, medical supplies, equipment, and transportation. The local authorities agreed to arrange for hospitalization and clinic room.

Investigation showed that the general hospital facilities for charity patients were poor. Erlanger Hospital, a semi-private institution, cared for only a small percentage of the city's indigent. Space for two wards was turned over to the service for maintaining venereal cases. These were furnished by funds from the Rotary Club and the local health department. The nursing service was supplied by the American Red Cross. A negligible amount of work had been done in the Chattanooga Free Clinic in the treatment of venereal cases. Two rooms of this clinic were diverted and equipped

for the treatment of female venereal cases. Two rooms in the county court house were equipped for the treatment of male cases. Nurses specially trained in venereal disease are in daily attendance, and these clinics are supervised by the specialist and an assistant.

A survey of the Chattanooga industrial plants showed a rather high prevalence of venereal disease among its male employes. Realizing that it would be impracticable to interfere with the routine of these industries in any way, and taking into consideration the value of coöperatve industrial clinics, the managing interests of these plants were approached on the subject of the formation of industrial clinics. An agreement was therefore reached whereby clinics would be financed by the industries and supervised by the Public Health Service. In order to procure a minimum maintenance cost, an assessment was based on the annual payroll of $1.00 per thousand or 0.1 of 1 per cent. To operate them successfully on this basis, it was found that each clinic should embrace about 2,500 employes. Two clinics have been established and a third is being organized. Clinic No. 1 embraces the employes of eleven factories, clinic No. 2 nineteen factories, and clinic No. 3 will embrace four factories. Organized thus the factory employing a very few men will have the same opportunity as those employing a larger number. By their formation we are reaching a class of patients which would probably never be reached by competent medical service. The popularity of this movement is evidenced by the fact that inquiries from manufacturers are constantly being made at this office as to the formation of other clinics.

In the beginning, the anti-venereal campaign was greatly handicapped by inadequate legislation relative to the reporting of cases and quarantine, and secondly by the lack of proper hospitalization. It was known that here, as elsewhere, venereal cases were not accepted when most amenable to treatment and when hospital treatment was most urgently needed.

The Tennessee Legislature in 1905 passed a bill specially exempting the reporting or quarantine of venereal disease. This law seriously interfered with the control of prostitutes. The writer held a conference with the State Attorney General and secured from him a written opinion to the effect that venereal diseases being dangerous to the health of the civilian and military population, under authority of previous statutes, the State Board of Health had power to pass such rules and regulations affecting communicable diseases which would protect the public health. Shortly thereafter the State

Board of Health passed a regulation requiring that the venereal diseases be reported to local health boards, and, being dangerous communicable diseases were subject to quarantine. In a test case brought before the Criminal Court the Court ruled that the local Health Department had the power to quarantine under the ruling of the State Board of Health. On the result of this decision all persons, who in the opinion of the Health Officer are suffering with venereal disease in a communicable stage, are, at his discretion, quarantined and held for treatment.

MEASURES IN FORCE

1. *Notification.*—All physicians are required to report their venereal cases to the office of the Public Health Service.

2. *Repression.*—Coöperating with the service, the military police arrest all known prostitutes and bring them before the Court for conviction. The Court then orders these women for examination for evidence of infection. All infected cases, whether convicted or acquitted of the charge of lewdness, are quarantined and treated.

The Florence Crittenden League, coöperating with the service, has allowed a hospital for the detention of these women to be built on its property. The funds for building and equipping this were furnished by the city and county authorities. The Government and the American Red Cross supply the medical and nursing service. The prostitutes are confined and kept under treatment until negative results are obtained. With a certain percentage of offenders, their social status is investigated, and they are paroled and allowed to receive clinic treatment. Strict account is kept, and on neglect of attendance, the offenders are arrested and put under quarantine. Besides these, there are numerous voluntary cases in regular attendance, as the result of social service work. The males are all voluntary cases, but in case of failure to attend the clinic, they are visited by follow-up nurses with a warning of quarantine. No patient is considered free of infection with gonorrhea until four successive negative slides have been obtained, and none are considered free from the communicable stage of syphilis until they have been thoroughly examined for clinical symptoms and have had a thorough course of arsphenamine.

3. *Educational methods.*—The press has been freely used in the education of the public and in advertising the clinic. Many pamphlets by various authors have been distributed in factories and public places; circulars, educating the male population, have been placed in public places in the zone.

4. *Diagnostic facilities.*—In conjunction with the clinic a well-equipped laboratory is supplied. Besides performing the usual routine of smears for gonorrhea and syphilis, Wassermann tests are regularly run. These tests are also made free of charge for all physicians in the zone.

Tabulated results since the organization of the clinics to date are as follows:

Gonorrhea.—Number treated to date (male, 358; female, 659)	1,017
Rendered non-infectious	97
Rendered non-infectious but continued under treatment	35
Treatment discontinued without permission	528
Treatment discontinued with permission	49
Cases on hand	343
Cases under 15 years of age	27
Syphilis.—Number of infectious cases to date (male, 129; female, 144)	273
Discharged as non-infectious	44
Rendered non-infectious but continued under treatment	48
Treatment discontinued without permission	164
Treatment discontinued with permission	14
Cases now on hand	57
Number of non-infectious cases to date (male, 93; female, 52)	145
Treatment discontinued with and without permission	64
Cases now on hand	81
Other venereal diseases to date	40
Prostitutes	630
Total number of cases to date	1,475
Treatment to date, all cases	24,054
Wassermanns taken	267
Arsphenamine administered, doses	775
Laboratory tests for gonorrhea	9,064
Laboratory tests for treponema pallida	118

Gonorrhea	70 per cent
Syphilis	30 per cent
Both	25 per cent
White	60 per cent
Colored	40 per cent

CONCLUSION

1. Of the general health activities in the extra-cantonment zones in relation to the protection of the military troops, the eradication of venereal disease is by far the most important problem.

2. Measures applied in this local community are applicable out-

side of the extra-cantonment zones and should be adopted to protect the future soldiers and the general public.

3. To control venereal disease the activities should be under the general direction of the Public Health authorities, but these should receive the hearty coöperation of all social, educational and law-enforcement agencies.

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THE BASE HOSPITAL LABORATORY[1]

By Major LESLEY H. SPOONER, M. C., U. S. A.
Chief of Laboratory Service, Base Hospital, Camp Devens, Mass.

AFTER ten months' work in meeting the pathological and bacteriological needs of a rapidly growing National Army base hospital and the epidemiological problems of one division, and of establishing upon a working basis such a laboratory as is found in most of our present army hospitals, it seems fitting to report such progress as will interest the clinician, the sanitary officer, and the laboratory man.

The work of a base hospital laboratory, as it has presented itself to this particular unit, seems to fall into three distinct divisions, which might be classed under the following heads: (1) Sanitary bacteriology, (2) routine hospital diagnosis, (3) technical training.

1. SANITARY BACTERIOLOGY

Under this term are included not only the usual laboratory examinations of milk and water, but especially the search for infectious disease carriers and the usual practice of methods of active and passive immunization.

Milk Examinations.—Little need be said under this heading, since the methods are precisely those employed by all standard health bureaus. Samples are collected weekly from various exchanges and messes throughout the camp, with especial care that at least one sample be obtained from each dealer supplying milk or cream to the camp. This work is in the hands of the sanitary inspector, and the greatest care is taken to send samples to the laboratory in the shortest possible time after their delivery to the distributing party.

Water Examinations.—This procedure is also identical with well-known methods, so it is only necessary to cite its application to specific needs. The water supply of the camp is derived from a single source, and, excluding leaks, no especial interest arises from such examinations, although they are performed as a routine to guard against accidents.

The investigation of wells, of streams along the line of march,

[1] Report from Laboratory, Base Hospital, Camp Devens, Mass., from October 1, 1917, to August 1, 1918.

and of ponds intended for swimming is of interest and of practical value to the health officers of the command.

Innumerable examinations of bottled soft drinks have failed to show appreciable or significant numbers of contaminating organisms.

Carriers.—The healthy carrier of pathogenic disease is today attracting universal interest. That individual is, of course, a menace to the health of anybody, especially when contact is so intimate as in the barracks of one of our army camps.

Meningitis Carriers.—The method employed for the detection of these carriers is that advocated by Flexner in a monograph published in 1917 by the Rockefeller Institute for Medical Research, and following the suggestions of "Standard Technique of Meningococcus Carrier Detection, adopted by the Medical Department of the U. S. A., U. S. N. and P. H. S." At first, cultures were made from the entire company from which the case of the disease arose. During the last three months only the immediate contacts of such cases, in barracks, mess, drill, or in the hospital, were examined, following the suggestion of the "Standard Technique" pamphlet referred to above. This had the effect of lightening this laborious work, and also of increasing the percentage of positive carriers detected. The suspects were brought to the laboratory, entering by the side door in order to prevent contact with the hospital itself. Swabs were taken from the nasopharynx, in a portion of the laboratory set aside for that purpose; bent stiff wire swabs, without glass protectors, were used. Inoculation of warmed blood plates was made directly. The usual methods of examination, identification, and agglutination were employed.

During the entire ten months, 2,000 healthy individuals were examined and eighteen positive carriers detected, a percentage of 0.9. During the past three months, due in part to improved technique, but apparently more to an examination only of those more intimately in contact with the disease, 116 were examined, and 8 carriers discovered, a percentage of 6.9.

All such carriers after isolation and appropriate treatment were rendered negative in a very short time, the maximum period of isolation being 12 days. The disease carriers, or those who harbored the meningococcus in the nasopharynx after recovery from the attack of the disease, were far less responsive to treatment. The maximum period of isolation in this group was 43 days; this soldier is still in the hospital giving positive cultures.

Diphtheria.—Diphtheria has been more prevalent in this camp

than has meningitis and, as would be expected, a larger number of carriers have been discovered.

Upon the diagnosis by the laboratory of a case of diphtheria, all members of the individual's company were brought to the laboratory and cultures made at once upon Loeffler's blood serum. It was found wise to employ this method rather than to have cultures taken in the camp and delivered to the laboratory (as is the practice in civil life), since, during the extreme winter weather, growth was found to be markedly retarded, if not prevented by exposure.

In all, 3,800 persons were examined and 140 positive carriers detected, a percentage of 3.7.

The positive healthy carriers may, according to the experience of this laboratory, be divided into two classes, the transient and the persistent carrier. In the search for diphtheria carriers it was necessary to rely for diagnosis upon the microscopic morphology and staining reaction of the organism, and the relative number of such bacilli. Limits of time, personnel and materials prevented more elaborate cultural differentiation, animal inoculation, etc. In order to safeguard as far as practicable against error in this respect, the following requisites for diagnosis were insisted upon:

First, the suspected type of organism must be present in at least moderate number in the preparation; second, the diagnosis must be made independently by three trained members of the staff or personnel.

Many men present cultures upon primary examination containing morphologically typical diphtheria bacilli, but repeated negative cultures after admission to the hospital. There are 80 such in this group; 95 showed negative cultures after the first day in quarantine, and 121 after the fifth. This empirical group represents the transient carriers. Those who retained organisms up to two weeks after discovery might be considered in an intermediate group. Those retaining organisms longer may rightfully be called persistent or chronic carriers. The latter class presents purer cultures of the Klebs-Loeffler bacillus than does either of the other two groups. As has been shown, though less strikingly, a parallel apparently exists in the case of meningococcus carriers.

Whether the presence of the organisms in the first group is accidental and of no consequence, it is difficult to say, but such seems to be the case. It is not well to generalize, but this rule would appear to apply to carriers in general.

The following table shows the distribution of carriers by days, upon which subsequent to admission, positive cultures were found:

Days after admission	Cases	Days after admission	Cases	Days after admission	Cases	Days after admission	Cases
0	80	6	3	11	1	17	1
1	15	7	2	12	1	21	1
2	6	8	1	13	2	62	1
3	7	9	1	14	.....	75*	1
4	9	10	1	15	2	85	1
5	4						

*Still in the hospital, with positive culture.

This grouping into transient and persistent carriers, while not sharply defined, is very distinct, and is of considerable importance.

Typhoid.—The results of the examination of urine and feces for typhoid bacilli, which was carried out among all cooks, bakers, cookees, and kitchen helpers in the camp, were somewhat surprising. In all 1,250 men were examined, and in no case were typhoid or paratyphoid organisms recovered from either source.

The feces were collected upon bent tin strips inserted into the corks of 120 c.c. bottles. Into these, when returned to the laboratory, was poured about 30 c.c. of lactose bile or lactose broth. This, after 4 to 5 hours incubation, serves not only as a dilutent of the feces, but the enrichment encourages growth of organisms of the typhoid group. Smears were made from this fluid upon endo, eosin-methylene blue, and brilliant green plates. The further procedure was that in present use in civic health bureaus. Experiments with stools artificially impregnated with typhoid and paratyphoid organisms showed this method to be highly satisfactory.

Malaria.—The introduction of two battalions of Florida negroes called for a malarial survey. In central Massachusetts malaria is unusual, so that the possibility of imported carriers seemed of importance. Single smears were examined from 2,000 negroes, but only one carrier was detected. During their residence, covering three months, in this camp, ten of this group developed malaria, all of the tertian type.

The small number of carriers is to be explained by the introduction of such men into a cold climate, also to the fact that only single smears were examined, and lastly, because the technique employed in the early examinations was not as satisfactory as that

later adopted. The latter consisted of the decolorization of thick smears by means of acid-methyl alcohol solution, and subsequent staining with polychrome methylene-blue and eosin. With this technique, parasites are located when only a few are present in the circulating blood.

Hookworm.—The group mentioned immediately above were also considered as possible hookworm carriers. Stools were examined in all negroes admitted to the hospital, regardless of diagnosis. Of 627 individuals examined, 153 showed ova of uncinaria in at least one specimen of feces, a percentage of 24.4. This high percentage was due in part to repeated and careful examinations by the men detailed to this work, but probably more to the use of hypertonic saline and glycerine suspension of the material, as suggested by Major Marshall A. Barber, S. C., U. S. A.

Prophylactic Inoculations.—The work on preventive medicine would not be complete without a word at least upon inoculations and vaccinations. The typhoid prophylactic was completed upon the entire personnel of this base hospital and upon two other such units, quartered here at different times. Smallpox vaccination was done upon the same groups. Tetanus antitoxin was administered as a prophylactic to all presenting suspicious wounds, where hypersensitization was not demonstrated by the intradermal injection of small amounts of dilute serum.

The Schick test to determine susceptibility to diphtheria toxin has been under the control of the laboratory for the past eight months. At first dilute toxin, and saline solution as a control, were employed. During the past six months dilute toxin heated to 75° C. has been substituted for the saline control, following the work of Zingher.[2] The right arm receives the toxin, and the left the control. This method facilitates inoculation, which is performed by two men, one individual receiving his two injections at the same time. Furthermore, by this means readings are facilitated and liability to confusion eliminated.

The erythematous non-indurated pseudo-reaction is tabulated in these figures as negative. The positive reactions conform to an empirical scale of three degrees. The single plus ranges from 0.2 to 0.4 cm. with slight induration; the double plus from 0.4 to 0.6 cm. with moderate induration, and the triple plus, which is interpreted as the true positive, over 0.6 cm. with marked induration. Readings are made at the end of 24, 48, 72, and 96 hours. Those

[2] Zingher, Journal American Medical Association, 1908, Vol. 70, p. 227.

presenting triple plus reactions at the end of the fourth day are considered susceptible and are immunized.

In the first period, covering about two months, this group was given 1.000 units of diphtheria antitoxin; but during the past six months they have been actively immunized by three injections at one-week intervals of toxin-antitoxin.

The following figures show the results of Schick tests:

	Number	*Percentage*	*Interpretation*
One plus	177	6.29	Slightly susceptible
Two plus	100	3.55	Moderately susceptible
Three plus	35	1.24	Highly susceptible
Negative	2,504	88.92	Not susceptible

11.08 per cent were more highly susceptible than normal; 1.24 per cent highly susceptible.

It is interesting to note that the true positive (triple plus) reactions appeared almost universally at the end of 24 hours and persisted through the fourth day. In no case was a positive reaction, even of slight degree, found in a carrier.

Twenty-one individuals received antitoxin following positive reactions; forty-two a full course of toxin-antitoxin. At the expiration of three months a small group of these inoculated soldiers returned to the laboratory for reëxamination by the Schick test. The following table is of interest:

	3-plus	*2-plus*	*1-plus*	*Negative*
Antitoxin group	1	2	2	1
Toxin-antitoxin group	0	0	1	4

83 per cent of those supposedly immunized by means of antitoxin showed susceptibility greater than normal; 20 per cent only were found susceptible after toxin-antitoxin treatment. This small group of susceptibles is an excellent tribute to the efficiency of toxin-antitoxin active immunization.

Following the advice of the Surgeon General, a large number of shaving-brushes were examined for pathogenic spore-bearing bacilli, with negative results. Previously, in an independent investigation, fragments of uniforms, stockings, underclothes, coats, and trench coats had been examined for similar organisms. Repeated cultures, aerobic and anaerobic, yielded negative results.

HOSPITAL ROUTINE

It has been the policy of this laboratory to perform all its work under one roof. This centralization of all branches has necessitated a large force working in relatively small quarters, but has had an

advantage sufficient to offset this, it would seem: the possibility of closer supervision of work of every character. This has resulted in the prompt performance, during the entire 24 hours, of all work submitted to the laboratory, a higher standard of work than might be attained under other conditions; and it has made possible the technical training of personnel, to which reference is made later.

It is of no interest to detail the nature of this work. Its scope may be seen in Table 1, showing the acute infectious diseases which have been diagnosticated in this laboratory.

Pneumococcus Groupings.—The methods employed are the combined techniques of Blake[3] and Avery.[4] The results are as follows:

	Number	*Per cent*
Type I	43	12
Type II	75	22
Type III	61	17
Type IV	172	49

It is of interest to note the preponderance of the different groups by periods. In the late fall the percentage of Type IV cases was very high. This was followed by a greater number of Type I cases. During the late winter, the streptococcus appeared in abundance, and when this declined there were many cases of Types II and III, which have been followed during the past two months by another rise in Type IV cases.

During the past two months an intensive study of blood cultures in pneumonia has been carried out. As early as diagnosis has been made, and often when it was only suspected, cultures have been taken. The methods employed are not of interest, save that as a routine broth cultures are examined at the end of 24, 48, and 72 hours, and upon each occasion sub-cultures made upon blood agar. The latter method is of considerable value, since in several instances a few colonies were grown in the 72-hour sub-culture, which would undoubtedly have been missed otherwise.

The direct agar plate method has been relatively unsuccessful, since plates have shown no growth where organisms are present in small numbers. When the blood contains many pneumococci, prognosis is often helped by an exact enumeration of organisms. To accomplish this the blood is citrated and pipetted into plates exactly as is done in water analysis.

During the last two months 110 bloods have been cultured, and 16 per cent found positive. Owing to the fact that many patients

[3] Blake, Journal Exp. Medicine, 1917, Vol. 26, p. 67.

[4] Avery, Journal American Medical Association, Vol. 70, p. 17.

suspected of pneumonia developed no such disease, these figures represent the total cultures studied and give rise to erroneous conclusions. Sixty-eight cultures were made upon 62 cases of pneumonia; of this number 14 cultures showed organisms, a percentage of 23.

The following table shows the positive and negative cultures in relation to the outcome of the disease process:

Bacteriological findings	Died		Recovered	
	Number	Per cent	Number	Per cent
Positive blood cultures	7	50	7	50
Negative blood cultures	1	2	47	98

The significant points to be noted from this study are that 50 per cent of cases showing positive blood cultures recovered, and only 2 per cent of those with negative cultures died. The preceding table shows that little knowledge as to prognosis can be obtained from positive cultures, though a negative culture points in 98 per cent of cases to recovery.

The same parallel in prognosis apparently exists in regard to types of positive blood cultures, as the following table indicates:

Types	*Died*	*Recovered*
Pneumococcus I	1	1
Pneumococcus II	2	3
Pneumococcus III	2	2
Pneumococcus IV	..	1
Strept. hem.*	1	..
Unclass	1	..
Totals	7	7

The correlation of the blood culture and the sputum has been of interest, and a brief review of three cases may be worth noting:

Date	*Sputum*	*Blood*
6-30-18	Type II	Type II
7- 6-18	Negative	No growth

In this man the sputum lost the infecting organism shortly after recovery.

* The streptococcus has been studied in its relation to pneumonia, empyema, and measles. This, together with an investigation upon large groups of healthy carriers now in progress, will be reported later.

Date	*Sputum*	*Blood*
7– 1–18	Type III	.....
7– 2–18	.....	Type I
7– 5–18	Type I	.....
7–11–18	Type III	No growth

In this case the Type III pneumococcus was evidently naturally saprophytic, but was overgrown by Type I organism at the height of the disease, but then only. A similar condition was shown in the following case:

Date	*Sputum*	*Blood*
7–18–18	Type IV	Type I
7–20–18	Type I	.....
7–28–18	.....	Type II (Autopsy)

This reinfection by another type of organism was borne out by the clinical picture of the disease, which had evidently started toward recovery under specific serum therapy.

WASSERMANN REACTION

The technique employed is the anti-sheep system, with cholesterinized human heart and acetone insoluble antigens. All cooks and bakers have been subjected to this examination. For the past two months it has been performed as a routine on all medical admissions. In all, 6,689 reactions have been done, which showed 880 positive readings, 13 per cent of the total. The double plus reaction, which alone is considered positive, represents complete inhibition of hemolysis.

At present two investigations are in progress in the laboratory. That this research already presents many points of interest is true, and it is to be hoped that their ultimate results will warrant the labor expended upon them.

LABORATORY INSTRUCTION

It might be assumed that all officers assigned to the Laboratory Division are thoroughly conversant in all methods of its work. This is, however, not true. It has been found necessary to train officers in many phases of work to which they have not been accustomed, and also to educate the enlisted personnel in a like manner. For this purpose officers are assigned to duty along those lines with which they have had least experience.

The enlisted personnel receive training by progression from the less to the more complicated. According to the individual's ability he spends four to eight weeks at each successive occupation, at first under the supervision of his predecessor, who makes an in-

terested teacher from the prospect of new and more inviting fields.

In this manner the untrained but intelligent soldier passes from dish-washer through the simpler to the more complex divisions of clinical pathology, to serology, special bacteriology and pathology. In the course of six to eight months of such training he is far better fitted for reliable laboratory work and judgment than the average medical student fresh from school and his interneship.

During the past month women technicians have been sent to various laboratories. Three are now working here. Their further training and education follows that of the men, although the more elementary steps are generally omitted. How far they are to replace men in the laboratory is yet to be seen.

The hearty coöperation and unceasing energy and unselfishness of the officers and enlisted personnel assigned to this laboratory have made the accomplishment of this great task possible, and even easy.

TABLE 1.—*Summary of Diagnoses for Ten Months Ending July* 31, 1918

	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Total
Epidemic cerebrospinal meningitis	1	0	2	3	0	1	5	2	5	1	20
Diphtheria	1	7	2	5	6	5	3	3	1	3	36
Malaria	2	1	0	0	0	0	4	6	4	4	21
Hookworm								49*	80	30	159
Intestinal parasites other than hookworm	0	2	2	1	0	4	1	0	5	1	16
Tubercle bacilli (in sputum)	5	1	9	12	1	2	1	4	7	6	48
Positive blood cultures								2†	9	9	20
Typhoid fever	1‡	0	0	0	0	0	0	0	0	1‡	2
Paratyphoid fever	0	0	0	0	0	0	0	0	0	1§	1
Wassermann:											
Double plus positive			46	49	74	69	130	150	125	89	732
Per cent double plus positive			15	16	27	13	12	15	10	7	13

* Colored troops arrived from Florida at this time, and a hookworm survey was started.
† Not recorded as such prior to this date.
‡ Had received no prophylaxis.
§ Had received first dose only of triple typhoid.

SCABIES AT THE EMBARKATION HOSPITAL, CAMP STUART, NEWPORT NEWS, VA.

By Captain C. G. LANE
Medical Corps, United States Army

ABOUT the middle of March of this year a special ward was established at the embarkation hospital for the treatment of infectious skin conditions. This ward has been changed and enlarged and is now occupying a separate tent ward of 42 beds with a latrine building of its own, well equipped with toilet facilities and showers with hot and cold water. Cases of scabies admitted to this ward include the cases detected at the usual pre-embarkation inspection of troops at this camp and at Camp Hill for the most part, with a few cases from the regiment acting as the camp guard, and a few cases in which a definite diagnosis could not be made. These latter cases had been excluded at the pre-embarkation examination and sent to the hospital with a diagnosis of scabies. They belonged to the same company and often in the same barracks as men with a perfectly definite diagnosis, and it was deemed best to treat these individuals with the others.

In the matter of diagnosis, little need be said about the typical case with nocturnal itching and generalized eruption of papules and vesicles with excoriations, and characteristic tortuous burrows between the fingers. In the doubtful cases, emphasis is placed on the localization of lesions on the hands and fingers, about the axillae, and especially on the genitals. Practically every case of any duration has papules and excoriations on the shaft or glans of the penis in addition to other suspicious lesions. These lesions are bright red in color, elevated and excoriated, and are often rather large and oval, due undoubtedly to the burrows, which can often be demonstrated in the more severe cases.

Since this ward has been established, 102 cases of uncomplicated scabies have been treated. Patients with other diseases or other dermatological conditions have not been considered in this summary. These patients received a total of 636 days' treatment, making an average of 6.2 days for each patient. It is believed that this average time can be shortened by the use of a small amount of betanaphthol in the ointment, and by a speedier return of the patient's clothes from the laundry, which has delayed the actual discharge from the

hospital in a number of instances. Of these 102 cases, three have been readmitted later as recurrences. One of these was among the earliest cases which came to the ward and gave a history of going back to his company and sleeping in his old blankets before they had been sterilized. The other two were individuals with very sensitive skins in whom the cutaneous appearance suggested a dermatitis of mild character from treatment rather than recurrence of scabies, no active lesions being found in either case.

The treatment can be covered best in two sections, the actual medical treatment and the prophylaxis, so called for the want of a better name. The individual starts his treatment the first night with a vigorous scrub with brush and soap under the shower, with instructions to "get the tops off" as many lesions as possible. Thoroughness in this part of the treatment is stimulated by telling the man that the better he does his part the sooner he will be discharged from the hospital. Following the bath, each man rubs in the ointment thoroughly over the entire body below the chin, paying special attention to the hands, axillae, and genitals. The ointment which has been used exclusively at this hospital is the official sulphur ointment, both alone and with the addition of balsam of Peru (4.0–8.0 gm. to 30.0 gm. of the ointment). A bath is taken the next morning with a complete change of pajamas and bed linen, and a lighter application of the ointment is made to remain on during the day. This treatment is repeated each day during his stay in the ward.

The preventive treatment is undertaken with the idea of prevention of reinfection in the individual and the prevention of the spread of the disease to others. In the first place, the clothes of each man, after being checked up, are sent to the hospital sterilizer and then to the laundry, before being checked in at the property room ready for the patient. All blankets, as well as the bed linen and towels, are sent to the sterilizer for treatment at the time when the soldier is discharged from the ward.

Every case of scabies admitted to the ward has been reported promptly through regular channels by name, rank and organization to the organization commander in order that the individual's blankets can be sterilized before his return to the company, and to prevent their use by others until such sterilization is accomplished. In addition, each patient before leaving the ward is instructed to see that his extra underclothes, towels and stockings in his barracks are boiled before being used again, and if necessary to sleep in his present clothes till this is done.

As a final step in the personal prophylaxis it has been suggested that these cases be followed up by means of a card sent out with each patient to his organization medical officer, advising an examination of the soldier's body one week after discharge from the hospital, with the idea of checking by early recognition and treatment any suggestion of recurrence of the condition.

ASCENDING NEURITIS AFTER TRAUMATISM

By 1st Lieutenant ORLANDO F. SCOTT
Medical Corps, United States Army

(Preliminary Report)

ASCENDING neuritis of the central end of a nerve with degeneration of the myelin sheaths and axis cylinders occurs in a limited number of all cases after trauma. In how many we do not as yet know. When this does occur, however, it may extend from the site of the traumatic lesion centrally to the spinal cord, producing complete destruction of the nerve.

We know and can speedily recognize the clinical symptoms of the classical type of ascending involvement, such as the pain centrally along the course of the nerve affected, pain on pressure over the nerve trunk above and below the lesion, extension of the areas of anesthesia or hyperesthesia, and even the spread of these symptoms to corresponding nerves of the opposite side. These irritative findings may be accompanied by muscular atrophy and paralysis. But in how many cases of slow, insidious development can we note and diagnose this pernicious complication in time to inhibit its progress? And what curative surgical steps have thus far been suggested as a proper treatment in such a crisis? No treatment sufficiently radical to effectually stop the progress of this destructive complication has so far been advanced.

As pointed out by Bénisty, "this phenomenon may be the cause of failure after nerve suture even under the most promising conditions." I am heartily in accord with this suggestion and, after studying this particular question and taking into consideration all of the dangers and possibilities, I am convinced that in all war wounds near a mixed nerve (with partial or total involvement of the nerve), the nerve should be exposed several centimeters above the wound under aseptic precautions, and the nerve *crushed*. There is a reasonable certainty that these operative wounds will heal primarily without infection from below.

In my opinion such a prophylactic measure, immediately carried out, will eradicate to a great extent upward infection and degeneration. The mere mechanical crushing of the nerve has no bearing on the ultimate nerve suture at the site of injury. By the time the wound has healed and the tissues are sufficiently organism-free to allow of nerve suture, the fibers have regenerated at the site of the

crushing and are found embedded in the neuromatous or gliomatous mass at the distal stump of the central end. When the nerve trunk is freshened regenerated fibers can be placed in contact with the distal stump. The same physiologic condition exists as would have been present if initial crushing had not been carried out.

I base my idea of this automatic prophylactic stoppage of ascending involvement of nerves on the experiments carried out by Lieut. Col. Percy Sargent, R. A. M. C., in connection with his method of blocking and stopping local tetany of muscles caused by local tetanus, mixed infection, or toxic absorptive extension, locally in the nerve affected, from an adjacent suppurating wound. After crushing in cases where section of the nerve was not present at the level of the wound, the local paroxysmal spasms ceased at once and in due course the nerve recovered its sensory and motor functions automatically. This seems ample evidence that the mechanical aseptic crushing of a nerve will prevent ascending involvement at once and thus will eradicate ascending degeneration.

It might further be mentioned that this procedure, by eliminating irritative symptoms, might possibly hasten the peripheral regeneration by preventing excessive and extensive central degeneration. It will absolutely prevent the irritative symptoms of causalgia, so that this feature presents another argument in favor of its adoption.

I feel justified, therefore, in advocating this procedure in all mixed nerves whose continuity is threatened or partially or totally involved, in order to eliminate ascending degeneration which might prove absolutely fatal to subsequent functional restoration.

EDITORIALS

A PERSONAL APPEAL

In November the Council of the Association appointed the undersigned as editor of the journal and secretary and treasurer of the Association, the three positions having been merged.

I know that custom and precedent rather favor the use of the first person plural in editorial writing, but in this instance I feel that the relation between the editor and the members of the Association is sufficiently close to warrant a less formal manner of address. Therefore, I pray that I may be pardoned and understood if I say what I have to say in this, my first address to you, as an individual rather than from the bulwark of the editorial "we."

It seems hardly necessary to dwell on any question of policy of the magazine or the Association. These have been both very clearly enunciated in the past, and a conformity to precedent should be all that is expected or required.

I do wish, however, to have a chat with those who make up our membership in regard to the welfare and the needs of the Association in order that it may be plain to all of us that the question of advance and betterment is one which concerns each individual and not any one man by reason of the fact of election to office.

At the time of the forming of the Association, the field of military medicine was a limited specialty. Necessarily so, in view of the modest provision made by the country for the personnel of the services, which was the field from which it drew its quota.

Even so, the project flourished and served the purpose not only of linking the various members of the regular services, but in bringing into touch those who made military medicine a profession and those who, from motives of patriotism, gave of their spare time that they might be prepared for service in the event of need.

With the facing of the European crisis and the necessity of putting our shoulder to the wheel in national effort, this line was, to a marked degree, broken down and the distinction between the military doctor and the civil practitioner became as vague as did all other differences under the law of universal service.

The consequence is that now, since April, 6, 1917, we as a nation have a working knowledge of ways and methods which were, prior

to that time, not clearly understood and, sad to say, in many cases a matter of little interest.

The entrance of the United States into war has created a community of interest in all that pertains to the profession of arms which did not exist before. The small nucleus of the armed forces has expanded and been enveloped by those who formerly regarded responsibilities of such character as beyond anything which possibility might force them to assume.

The camp and the trumpet, duty at sea, the systematic care and safeguarding of large bodies of men have come to have a very real meaning, and as this awakening has come there must follow in its wake a sustained interest, based not only on the reminiscent side but on the sober realization that from the view of human probability there will, at some time in history, come another crisis when we shall be called on to give ourselves and our knowledge to the nation's need.

As we have prepared, during the time of mobilization and training we have learned, I think, what we may have to do and we have been brought to a realization of the magnitude of the task.

What I have said seems to me evidence of the necessity for the continuance of the work of our Association. Where in the past it has been something which was of live interest to the few, it is now a question which touches the majority of the profession, and there are not many who do not have, in some sense or other, a personal touch with the military side of the physician.

For that reason I wish to make in this, my introduction to you, a very earnest plea for support of our Association. It is at present on a firm basis, but there is every reason why it should expand and take on a much broader character than at present. There has always been a tendency after wars to form societies and associations commemorative of the days of campaign. There seems no reason why this in our case should not be accomplished through the medium of our already existing society, thereby taking advantage of what is already established instead of seeking to build anew.

With the number of medical men who have seen service under the flag, the membership should from now on show steady and substantial increase.

There is only one way in which this may be accomplished, and that is by concerted action. It is not to be thought that the effort of any one, or any few—the president or the secretary, or the editor, will be sufficient, unaided, to attain this result.

The Association is not run by the president, the secretary or the editor. Its welfare lies in the hands of each one who holds membership, and its advance is dependent on the effort and the goodwill of the majority rather than of the few who hold office.

Therefore, as secretary, I take this opportunity to remind the rest of my fellow-members of this fact and to say that I have confidence to believe that they will use all proper means to increase our membership and aid in making the Association one which may count in its number as many as possible of those eligible to join. A few words of explanation of the purposes and advantages from those who already belong will go far to add to our Association.

In a measure, the same thing is true in regard to the standard of excellence of the journal, the official organ of the Association. This is peculiarly a child of the Association and dependent for its existence on the effort and thought of those who form the Association.

You have seen this magazine grow into a dignified and authoritative publication, and I am sure it has been a matter of pride. To keep it so and to increase its value should be equally a matter of interest. My part as editor I shall carry out to the very best of my ability, but without coöperation on your part I cannot bring the work to the measure of success which we all desire. With the experience of the war there must be a wealth of material which cannot fail to be of very keen interest to us all. To get hold of these experiences and put them before the membership of the Association is the part to be played by the editor and the journal. Will you not all help in this?

Finally, I should like to say that which might go without saying—that I appreciate the honor of serving in the office which I hold and that I shall give of my best endeavor to make my stewardship satisfactory to those who have placed this confidence in me. That I may better do this, I shall be glad to answer any questions or to receive any criticisms or suggestions as to the betterment of the journal or the advancement of the Association. I am a member of the Association and have its welfare very much at heart.

James Robb Church.

LESSONS FROM OUR RECENT EPIDEMIC

The sanitary history of every war of magnitude has taught lessons that brought about notable advances in military sanitation. The present war is no exception. Already we have been impressed

with the heavy sacrifice in human lives demanded for the privilege of assembling large numbers of men in barracks.

Scourges of typhoid fever and smallpox have been practically eliminated by specific measures. In spite of every effort, however, pneumonia, influenza, measles, cerebrospinal meningitis, scarlet fever, and diphtheria have prevailed quite extensively in camps, and, until similar specific measures have been discovered and perfected to combat them effectively, we are compelled to resort solely to general hygienic measures.

It seems well established that the latter group of infectious diseases are not ordinarily "air-borne," this being demonstrated by the successful treatment, without cross infections, of a variety of infectious diseases in a common hospital ward, as is often the practice in some civil hospitals.

While it has thus been shown that infectious diseases are not strictly "air-borne," it is nevertheless quite certain that they are transmitted through the medium of respiratory exhalations, these containing globules or droplets of mucus enclosing disease germs. When these germs are inhaled by a non-immune, the disease is thereby transmitted.

It can be assumed that certain doses or concentrations of disease germs are necessary to produce the disease. This fact emphasizes the necessity for both a liberal allowance of cubic air space per individual and an efficient means of ventilation, so that respiratory exhalations may be diluted below the danger point. In the presence of an epidemic, however, these simple, sanitary measures are insufficient. Steps must be taken to prevent affected individuals from spreading disease, and this can only be done by limiting the opportunity for coming into close contact, more especially *indoor contact*, with others. Outdoor contact is much less dangerous than indoor contact for the reason that infected respiratory exhalations are presumably so largely diluted at once as to render them innocuous and, unless an affected individual coughs or sneezes directly into the faces of others, there is little if any probability of transmitting diseases.

Taking the usual method of the spread of infectious diseases into consideration, it would appear that something further might be done to limit their spread.

It is manifestly impossible to detect and isolate cases during the period of incubation and the very dangerous early stages of the disease. Yet it is obvious that further steps may be taken to

limit the opportunity offered infected individuals to spread the infection.

This fact might be taken into consideration in the construction and arrangement of barracks. Instead of providing large dormitories, barracks should be divided into small squad rooms and corresponding divisions made of the dining rooms, each room having a separate entrance from outdoors.

Should an epidemic threaten, steps could easily be taken to prevent indoor intercommunication between various squads and, by closing all amusement halls, etc., the opportunity for an infected individual to spread the disease would be limited to a single squad.

Outdoor drills and exercises need not be curtailed, as outdoor infection plays but a minor rôle in the spread of infectious disease. The essential fact not to be lost sight of is that indoor contact in common barracks, dining halls, amusement places, etc., must be reduced to a minimum. By this means alone can the spread of contagious diseases be checked during this present stage of development of our medical technique of protective inoculations. Until our medical science can offer us specifics for each form of these infectious diseases, segregation as above outlined should be carried out.

P. F. Straub.

THE ROYAL ARMY MEDICAL CORPS

Before we had an opportunity to become personally acquainted with members of this fine corps, we had read of their many heroic deeds in action. Since meeting them in camps and hospitals, I have never questioned their worth. Those of the Medical Reserve Corps who have served with them at the front have learned to know them well.

Intelligent, model strict discipline, devoted to duty, the men of the Royal Army Medical Corps, privates and noncoms., can be depended upon every time. As for the British surgeons, are their names not written on the honor roll of many a bloody field?

Their traditions are different from ours. It has been our teaching that the lives of the medical personnel are too valuable to their organizations to take undue chances. Doubtless we shall cast aside this tradition, as the British have done, in view of the immense importance of morale in this war. It is a hard test for troops to see neglected wounded lying for hours between the lines, uncared for, and harder still to feel that the Hospital Corps men are waiting in safety in dugouts while they are in deadly peril. The

calm bravery necessary to attend to the wounded without the stimulus of action and retaliation on the enemy afforded to the advancing troops is not considered. Every man likes to feel that he will be attended to promptly if he falls, and it is contrary to the instincts and training of the Medical Corps to avoid personal risks when there is life to be saved.

The mortality among the British surgeons and stretcher-bearers has been heavy, and their devotion to duty, without thought of danger, worthy of the best traditions of the British officer, who always leads his men. Doubtless we shall follow their example, as we are of the same blood, and bring in our wounded. Our young officers have already done so. The high spirit of youth does not admit of cold calculation under the stimulus of combat. We cannot ask our men to go where we do not, and I doubt not that, inspired by the example of the Royal Army Medical Corps, we shall write a new paper on the honorable history of our corps, the names of those who were "faithful unto death."

H. C. Coe.

CURRENT LITERATURE

Blood Transfusion in War Surgery, by L. Bruce Robertson, B.A., M.B. Tor., late Major, C. A. M. C., and Surgical Specialist, Canadian Casualty Clearing Station, B. E. F. *The Lancet*, June 1, 1918, pp. 759–62.

Blood transfusion appears to have found a place on the battlefields, thanks to all those who have in the recent past contributed their share to the perfection of the technique necessary for its successful performance. The present contribution seems to cover the ground of its usefulness and to have demonstrated its claim as a lifesaving therapeutic measure within the war zone. We may, therefore, merely by calling attention to the timely importance of the paper, and without going into the details of it, discuss a few points for the benefit of our readers.

There are, according to our author, at the present time, three of the indirect methods of blood transfusion in general use on the British front: (1) Syringes and cannulae; (2) paraffined glass containers; (3) anticoagulant (citrate method).

1. The syringe-cannula method, as worked out by Lindeman, is very briefly described as follows: "A cannula is introduced into the recipient's vein and one into donor's vein. I have found it expedient to attach a short piece of rubber tubing to each cannula. By means of 20-c.c. Record syringes, worked in series, blood is withdrawn through the donor's cannula and injected into that of the recipient. Between the successive withdrawals or injections of blood, in donor or recipient respectively, a small amount of normal saline is forced through the cannula to clear it of blood and prevent clotting. The syringes and cannulae at the start may be lubricated by drawing liquid paraffine through these. One operator and one assistant are necessary to transfer the blood, while a nurse is required to flush out each syringe before it is used again." By this method, the author states that he has completed a transfusion of almost a liter of blood in 19 minutes from beginning to end of procedure; that the method lends itself admirably to the desired purpose, is well under the control of the surgeon, the total amount of blood being not more than 15 to 20 seconds outside the body and the blood can be transferred slowly or rapidly.

2. *Paraffined Glass Container* method of Kimpton and Brown. This method makes use of glass receptacles lined with paraffine and having a capacity up to 500 c.c. Without describing the details of the method, it may suffice to say that these tubes are sterilized for 20 minutes in an autoclave, after having received a lump of hard paraffine about the size of a walnut. After sterilization, the tube containing the liquified paraffine is rapidly turned about, while hot, to insure the uniform lining of the cylinder. The receptacle, under ordinary precautions, is filled after connecting its cannular end with the previously exposed donor's vein and then its contents are transferred to the recipient by making a similar connection of its cannular end with the vein of the recipient. By this method, our author states that he has removed "490 c.c. of blood from the donor in four and a half minutes without the latter showing the slightest discomfort,"

adding, however, that "the limit of safety as regards clotting is from 10 to 12 minutes after the blood first enters the tube."

3. *Anticoagulants* (citrate method). This method, from which at first so much was expected, does not seem to have appealed to our author, who says: "From an experience of little more than a dozen cases . . . my impression was that the response, as shown by fall in pulse rate and rise in blood pressure, was not as immediate as with transfusions with unmodified blood (syringe method, etc.)".

In his very fair discussion of the advantages and disadvantages of the indirect methods, our author, nevertheless, betrays his leaning toward the syringe method and to which, in the opinion of the reviewer, his experience fully entitles him, adding that "one should be prepared to use that method best suited to the case and to the condition present."

Since it is clearly impossible to lay down hard and fast rules governing blood transfusion, the author wisely limits his remarks to the indications presented in acute hemorrhage either primary or secondary, severe anemia from repeated hemorrhage or continued oozing and long-continued sepsis.

With reference to post-transfusion reactions, the author says that the majority of them consisted in a chill with a subsequent rise of temperature; that hemoglobinuria was observed by him in only three cases, all of which were fat. As to dangers of hemolysis he mentions that "serious incompatibility may usually be recognized early by making a preliminary injection of 15 to 20 c.c. of donor's blood with the recipient's circulation. If no symptoms occur within one to two minutes, the blood may be regarded as sufficiently compatible and the transfusion may be proceeded with." That cross-transfusion can be done safely in many cases is shown by the number of recoveries in this series, as it is not conceivablet hat donor and recipient were always of the same group. We can honestly recommend the perusal of this admirable account on blood transfusion to those of our colleagues in the field or those in positions to make use of it.

H. G. Beyer.

I. The Pathology and Pathogenesis of Myelitis, by N. E. Wayson. **II. Experimental Poliomyelitis,** by J. P. Leake. **III. Attempts to Induce Poliomyelitis in Small Laboratory Animals,** by A. M. Stimson. **IV. Report on Attempts to Cultivate the Virus of Poliomyelitis,** by N. E. Wayson. Hygienic Laboratory Bulletin No. 11, United States Public Health Service.

I. The first paper in the bulletin, by N. E. Wayson, may be characterized as a concise, rather non-committal story of the various attempts made in the past, by different pathological histologists, at exciting, artificially, by mechanical, chemical or even specific means or agents, certain diseases involving definite groups of cells and tissues, located in the brain or spinal cord, making up the diseases known as the "*myelitides.*" The author traces these various attempts from their early tentative beginnings in which the, now considered, rather crude methods by mechanical agents were employed, up to the time when the more refined methods of experimentation with specific agents began to be employed, with similar ends in view. The conclusions arrived at by the author must be

deemed decidedly vague or negative. While plainly admitting the existence of specific etiological factors for poliomyelitis, he, at the same time, adds "that numerous workers have produced myelitis through the injection of various pathogenic organisms and their toxins, including the streptococcus, staphylococcus, typhoid bacillus and colon bacillus." The desirable constancy of the results in the experimental reproduction of the disease by cultures is said to be lacking and the work of Noguchi and Flexner with regard to the isolation of a minute filterable organism reproducing the disease after several culture generations is said to have so far failed of confirmation by workers outside of their laboratory, with the probable exception of Rosenow, who "believes he has isolated the organism found by Noguchi and grown it into a polymorphic streptococcus which produces the disease when injected into the venous circulation by reason of its selective or elective localization." The reviewer, nevertheless, fails to see how Wickman's work could possibly be made to count against the seemingly strong probability of the specificity of the organism described and isolated by Noguchi and Flexner.

II. The second paper, by J. P. Leake, presents the results of experiments with "Virus of Human Origin obtained during Epidemics" of poliomyelitis. These experimental results appear to be firmly established on scientific grounds and are stated in concise and unmistakable terms. They are well calculated to impress the reader with the indubitable specificity of the virus causing the disease known as poliomyelitis, which is pathogenic in men and certain classes of monkeys.

When, as is done in the summary, these uniformly positive results, following the inoculations of material from the New York cases, are styled by the author as unusual and their interpretation as difficult, the reviewer, in view of the previously well-established existence and specificity of the virus contained in the cords of men and certain animals dead with the disease, feels, on the contrary, that such results ought to be considered as in accordance with the expectations held out to us by an accepted theory and that no further apologetic attempt at explaining them by a possibly high virulence of the epidemic or of the unusual preservative attributes inherent in a 100 per cent glycerin, would seem to be required to convince the student of the remarkable success of the author's work.

III. The third paper, by A. M. Stimson, "Attempts to Induce Poliomyelitis in Small Laboratory Animals" gives the following conclusions at which the author arrived after many experiments:

"No evidence was adduced by these experiments to show that rabbits, guinea-pigs, or rats are susceptible to poliomyelitis.

"Other observers have reported the successful infection of rabbits and guinea-pigs with poliomyelitis virus. Their methods did not differ essentially from those employed by us. We must therefore attribute the discrepancy to one or the other of two causes. Either the strain of virus employed by these observers differs from ours in its pathogenic properties, or it is contaminated with some organism capable of producing these symptoms in small animals."

IV. In the report, by N. E. Wayson, making the fourth paper in our Bulletin, the author gives us an account of a large number of very painstaking experiments and in which he endeavored to cultivate the virus of epidemic poliomyelitis, which experiments, however, all proved very decidedly negative. Thus,

notwithstanding the author's carrying out the technique employed by Noguchi and Flexner in his endeavors to obtain results identical with theirs and, in spite of his 700 primary cultures and 300 animal tests, he did not succeed, although he noted the presence of diplococci and streptococci in several samples of ascitic fluid, when cultures, obtained from the spinal cord and brains of subjects of acute poliomyelitis, were made under a lowered oxygen tension. None of these organisms, in the hands of our author, produced either the clinical or the histological evidences of the disease, even if such organisms might require development for several days incubation before becoming evident. Popularly speaking, it will always remain a distasteful task to be compelled to publish results that are so decidedly at variance with those of another author, as these are; all the more admirable, on the other hand, is the confidence in the conscious accuracy and correctness of one's work and the corresponding courage required to state it plainly and unequivocally.

H. G. Beyer.

Toxic Action of Carbonic Acid and Other Weak Acids on the Meningococcus, by J. A. Shaw-Mackenzie, M.D., Lond. *Jour. Roy. Army Med. Corps,* Vol. xxxi, No. 1, July, 1918, p. 1.

Dr. Mackenzie starts out with the very plausible argument that any substance known to be toxic for a definite microbe infecting certain tissues, ought to be carried there in solutions that, in themselves, are not injurious to these tissues so that we may not have to fear any other injurious action than that due to the disinfecting agent we add to it. Since, according to Halliburton, the cerebrospinal fluid is but a "Ringer-Locke's fluid of physiological origin," he sees abundant grounds for using the latter as a medium for the antiseptic treatment of the nervous system.

In some previous experiments with copper-alanine he had been able to show that in two out of three controls with a 0.85 per cent NaCl solution alone the meningococcus survived, while in all three of the controls with Ringer-Locke alone, it failed to survive. This rather unexpected observation, suggesting that Ringer-Locke's fluid, in addition to its non-injurious properties towards nervous tissues, possessed bactericidal properties towards the meningococcus, he very naturally concluded that the value of this solution for irrigation purposes and intrathecal use had become still more evident.

The composition of the Ringer-Locke solution, employed by the author, was as follows: NaCl, 0.9 per cent; KCl, 0.042 per cent.; $CaCl_2$ (anhydrous), 0.024 per cent; dextrose, 0.1 per cent; $NaHCO_3$, 0.02 per cent.

We must here omit the details of the bacteriological technique employed, with the exception of stating that the various transplants from the different solutions, to the action of which the meningococcus had been subjected onto trypan agar slopes, were made after exposures of five, twenty and sixty minutes at 37° C. and the results read off in 24 and 48 hours.

In accordance with this procedure, the behavior of the meningococcus was studied not only in Ringer-Locke's solution but also in solutions of its separate chemical constituents, in the course of which it was shown that the meningococ-

cus, in two out of three experiments with Ringer-Locke's solution, did not survive a sixty-minutes exposure; that it did survive a five, twenty and sixty minutes exposure to distilled water as well as to a 0.85 and 0.9 per cent solution of NaCl. Solutions of $CaCl_2$, KCl, dextrose in 0.85 and 0.9 per cent strength, favored the survival of the coccus; it did not survive in a 0.2 and 0.04 per cent solution of $NaHCO_3$ in sodium chloride solution. From these observed facts, it was concluded that the injurious action of the Ringer-Locke's solution on the meningococcus was to be ascribed to its content of $NaHCO_3$. The apparently paradoxical fact, observed in some subsequent experiments—namely, that an increase in the $NaHCO_3$ content of the solution, from 0.02 to 2.0 per cent, diminished instead of increased the toxic action on the meningococcus—and assuming with the author, for a moment, that CO_2 in reality exerts the supposed injurious action on this coccus, such a fact might possibly find an explanation on the basis of the now well-established theory that ionization in tissues, after exposure to certain electrolytes with univalent cations, is directly inhibited through the presence of such salts in too great concentrations (Jacques Loeb) and, consequently, there were no CO_2 ions available to do the work in solutions in which $NaHCO_3$ was present to the extent of 2 per cent.

It would be difficult to disagree, without further experimental evidence, with the following conclusions of the author, although the last word may not have been spoken on this interesting and important subject:

"CONCLUSIONS

"1. The meningococcus survives exposure to Ringer-Locke solution.

"2. Sodium bicarbonate (0.02 per cent and 1 per cent) in sodium chloride solution exerts a toxic effect on exposures of sixty minutes; a 2 per cent solution has no toxic effect.

"3. CO_2 and other acids in small concentration exert a toxic effect.

"4. In Ringer-Locke solution containing free CO_2 twenty-two vols. per cent and upwards, the meningococcus does not survive exposure of twenty minutes. In sodium chloride solution the toxic effect is more marked.

"5. The toxic action of serum through which CO_2 gas has been passed is pronounced.

"6. Lactic and acetic acid in M/5000 and M/2500 respectively (in 0.9 per cent sodium chloride solution) have a similar toxic action on the meningococcus.

"7. The preliminary experiments on the hydrogen ion concentration have not yielded sufficiently definite results to determine at what point the toxic action is exerted, and do not exclude a specific action of its own on the part of CO_2.

"8. It is suggested that normal solutions containing increased amounts of CO_2 or lactic acid may, as physiological antiseptics, be employed in the local treatment of areas, intrathecal and naso-pharyngeal, infected with meningococci, and that even the CO_2 normally occurring in the plasma and body fluids may form part of the protective processes of the body."

H. G. BEYER.

BOOK REVIEWS

THE SERIOUSNESS OF VENEREAL DISEASE, by Sprague Carleton, M.D., F.A.C.S. New York: Paul B. Hoeber. 67 pages, illustrated.

This book consists of twenty-six illustrations showing well-marked cases of gonorrhea, chancroid, chancres and syphilitic eruptions and sequelae. With each illustration there is a short description which may be comprehended by the laity. There are also sets of instructions for men having gonorrhea and syphilis. It is intended for distribution among young men in order that the conditions shown may deter them from exposing themselves to similar evils.

It is quite probable that it will accomplish a certain good in this way, though the preference of the reviewer would be for talks, litera ture of another kind or lectures, and perhaps illustrations of a different kind which would remain in the hands of the physician. The presence of this sort of literature is conducive to syphilophobia and syphilitic neurasthenia, and these diseases cause more suffering and are more difficult of treatment than syphilis itself.

M. A. REASONER.

DISEASES OF THE MALE URETHRA, by Irvin S. Koll, M.D., Professor of Genito-Urinary Diseases, Post-Graduate Medical School and Hospital, Chicago. Octavo, 151 pages, with 123 illustrations, several in colors. Philadelphia and London: W. B. Saunders Company, 1918. Cloth, $3.00 net.

This book is carefully and concisely written and is well arranged. It is doubtful if many of us can read carefully the chapters upon gonorrhea without gaining a better conception of the pathology of the disease, and in this manner a better comprehension of the principles underlying its proper treatment. The schemes of treatment as laid down are both rational and simple. It is interesting to note that the author accepts the dictum of E. L. Keyes, Jr., to the effect that gonorrhea as such does not persist in the male over a period of three years. He also accepts and discusses in some detail the work of Warden upon the etiology of the disease. The complications of gonorrhea are equally well handled, the pathology of the various processes being always a prominent feature. The discussion of epididymitis and stricture is especially interesting. A chapter on non-gonorrheal urethritis shows some considerable thought and experience. The concluding chapters present satisfactorily the subjects of sexual impotence, sterility, verumontanitis and utriculitis.

The author's statements to the effect that the gonococcus probably lodges in the fossa navicularis as a result of suction at the time of ejaculation, and that argyrol is very weakly germicidal compared with protargol and other compounds of silver and albumin, are open to

question. It is doubtful if the use of the additional synonym "tripperfaden" adds to the discussion.

The book is well illustrated and is printed upon a good quality of paper and well bound. M. A. Reasoner.

War Surgery of the Abdomen, by Cuthbert Wallace, C.M.G., F.R.C.S., Eng.; M.C., B.S., London; Surgeon, St. Thomas Hospital; Lecturer on Surgery in the Medical School; Consulting Surgeon, British Armies in France. 26 illustrations. Philadelphia: P. Blakiston's Son & Company, 1918.

This book contains the experiences in abdominal surgery on a sector of the battle line over a period of thirty months. It is founded on the practice of many surgeons, working under different conditions and in different hospitals. The author states that the personal equation and influence of locality have thus been largely eliminated.

In the introductory chapter, the change from the expectant to the operative methods of treatment is traced and the influencing factors described. Chapter 2 contains a general review of abdominal wounds and some very illuminating diagrams. Other chapters discuss where to operate and diagnosis and treatment considered generally. Wounds of particular organs are described in detail and many valuable statistics are given.

The book is timely and up to date and the subject is presented in a pleasing form.

Francis M. Munson.

Tropical Surgery and Diseases of the Far East, Including Answers to a Questionnaire, by John R. McDill, M.D., F.A.C.S.; Major, M. R. C., U. S. A.; former Professor and Head of Department of Surgery, College of Medicine and Surgery, University of the Philippines; Member Far Eastern Association of Tropical Medicine, etc., etc. Approved for publication by the Surgeon General of the United States Army. St. Louis: C. V. Mosby Company, 1918.

The Philippine veterans and other medical officers of the Army and Navy who have served in the Orient and who read this interesting volume will surely recall the "Days of the Empire" in Manila and "Hear the East a-callin'," for Major McDill has breathed the spirit of that alluring part of the world into his new book.

Part one is devoted to the conditions supposed to modify surgical procedure in the tropics, surgical diseases rarely seen elsewhere; also those seen mostly in equatorial lands, but transportable to other countries, and likely to come within the experience of any medical man. In the introduction the author states: "the general principles of pathology, therapeutics and operative technique, common to all fields of surgery, apply in all parts of the world. Strictly tropical diseases are few and unimportant, and can be described in a few words. 'Tropical disease' is a term of convenience, but is hardly more accurate than

would be the term 'arctic disease;' though frostbite may be as rare in the tropics as heat prostration is in the arctics, neither affection should be classified as a strictly climatic condition. Certain surgical as well as medical diseases, whose causative agent is ubiquitous, flourish best in warm countries, but their frequency and their control depend upon personal hygienic measures whose principles are also as universally applicable as are those of surgery."

Part two is intensely interesting and includes observations on China, Japan and the Philippines, and collated answers to a questionnaire of fifty-three inquiries sent to countries in and about the tropic zone in 1911. A medical survey of a typical Filipino country town of 6,000 inhabitants is described, the reading of which vividly recalls

"The land of dopey dreams,
Smiling, happy Philippines."

Answers to the questionnaire were received from the Philippines, Japan, China, Indo-China, Ceylon, Straits Settlements, Guam, Samoa, Burma, India and parts of Africa. The medical men who contributed data are prominent in their fields. Many have been living in far eastern countries the best part of their lives and are still there. The best reports were received from surgeons of the United States Army and Navy.

FRANCIS M. MUNSON.

SURGICAL APPLIED ANATOMY, by Sir Frederick Treves, Bart., G.C.V.O., C.B., S.S.D., F. R. C. S., Eng. Seventh edition, revised by Arthur Keith, M.D., LL.D., Aber.; F.R.C.S., Eng.; F.R.S., etc., and W. Colin Mackenzie, M.D., Melb.; F.R.C.S., Edin.; F.R.S.E., etc. Illustrated with 153 figures, including 74 in color. Philadelphia and New York: Lea & Febiger. Price, $3.00.

Many additions and some minor alterations have been made in the new edition, but this book still retains the spirit, form and size so familiar to surgeons for the past generation. The experience of military surgeons in the field has necessitated a few modifications of the text. Considerable has been added that will be of assistance to orthopedic surgeons in reconstruction work among the wounded soldiers and sailors. Twenty-seven new illustrations have been introduced.

The terms of the new anatomical nomenclature are inserted side by side with the old ones.

FRANCIS M. MUNSON.

MILITARY SURGERY OF ZONE OF THE ADVANCE—Medical War Manual, No. 7, by George de Tarnowsky, M.D., F.A.C.S.; Major, M. C., U. S. A., American Expeditionary Force, France, 1917-1918; Surgeon to Cook County and Ravenswood Hospitals, Chicago. Philadelphia and New York: Lea & Febiger, 1918. Price, $1.50.

This little volume is a résumé of the primary treatment of war wounds which experience on the western front has proved most satisfactory. It is not intended

to be a text-book on military surgery and is written essentially for those who are well grounded in the principles and practice of surgery in times of peace, but who are now called upon to assume for the first time the rôle of military surgeon.

In two chapters devoted to the French and British zones of the advance respectively, the author visualizes the conditions which have been successfully met by our army surgeons. The chapter on compound fractures and those on wounds of the upper and lower extremities contain good illustrations. Gas poisoning and trench foot are discussed and the latest treatments given. A chapter on roentgenology in war surgery embodies the standard methods approved by the Surgeon General's Office, U. S. Army, for the localization of foreign bodies in army service. The last chapter is devoted to the Carrel-Dakin technique

FRANCIS M. MUNSON.

A TEXT-BOOK OF ELEMENTARY MILITARY HYGIENE AND SANITATION, by Frank R. Keefer, A.M., M.D., Colonel, Medical Corps, United States Army; formerly Professor of Military Hygiene, United States Military Academy, West Point. Second edition, reset. Philadelphia and London: W. B. Saunders Company, 1918.

This text-book, prepared primarily for the instruction of cadets at the United States Military Academy, West Point, has been found to have a wider sphere of usefulness. It is suited to the requirements of officers and men of the Regular Army, the Navy, the National Guard, and the National Army, in organizations other than the Medical Department; also of students at civil institutions having military courses, Red Cross units, Boy Scouts, and those having charge of camps (construction, mining, recreation, etc.).

In the second edition Colonel Keefer has brought this valuable manual up to the minute. The sanitary measures made necessary by the new conditions of warfare are described and many useful illustrations added. The chapters on "The Hygiene and Sanitation of Marches and Battlefields" and "Hygiene and Sanitation in Trench Warfare" are specially to be commended.

FRANCIS M. MUNSON.

HEALTH FOR THE SOLDIER AND SAILOR, by Irving Fisher, Professor of Political Economy, Yale University; Chairman, Hygiene Reference Board, Life Extension Institute, and Eugene Lyman Fisk, M.D., Medical Director of the Life Extension Institute. New York and London: Funk & Wagnalls, 1918. Price, 60 cents net. By mail, 64 cents.

This timely manual of sanitation for our fighters by land and sea is adapted in part from the authors' recent work "How to Live." It is conveniently bound in khaki cloth, pocket size, and embodies a great deal of matter of vital importance to our men in camps, in the trenches, and on shipboard. It shows the soldier or sailor in a clear, concise fashion just how to manage himself physically, what to do and what not to do in order to keep fit, and how to protect his health under all possible conditions.

All the information contained in the little volume is from the best authorities,

civil and military, but obviously service conditions, especially in war time, render it impossible for the enlisted man to follow the instructions pertaining to such matters as diet, air, exercise, etc.

FRANCIS M. MUNSON.

NAVAL HYGIENE, by James Chambers Pryor, A.M., M.D., Medical Inspector, United States Navy; Master of Arts in Hygiene, Johns Hopkins University; Head Department of Hygiene, U. S. Naval Medical School; Professor of Preventive Medicine, George Washington University. Published with Approval of the Surgeon General, U. S. Navy, and by Permission of the Navy Department. With 153 illustrations, 12mo. Pp. vii+507. Philadelphia: P. Blakiston's Son & Co.

The special phase of hygiene covered by this book, dealing as it does with the keeping in health of men in abnormal conditions of living, is one that promises to become of special importance to Americans, what with the increase in both our Navy and our mercantile marine. And with the heightened interest in sanitation in general that promises to be one of the direct benefits to be anticipated from the present war, this volume should play a valuable part in the improvement of too frequently lamentable conditions aboard merchantmen, even though it is written with particular reference to life on the man-of-war.

Thorough discussion is devoted to subjects of a general character, such as air, heating, water, light, food, etc., on shipboard, with special chapters devoted to the consideration of more exclusively maritime matters, diving, swimming, marine life dangerous to man, etc. The infectious diseases of principal importance from the naval viewpoint are discussed, though rather briefly. In this connection it is unfortunate that, probably from space considerations, a number of the rarer tropical or oriental diseases, with which the naval medical officer may come in contact, are not mentioned, as, for instance,i nfection with Schistosomum japonicum, danger of which has necessitated special rules for the conduct of sailors in inland Chinese waters.

Aside from this minor omission, the book is well designed to serve its purpose as a general basis for sanitation on shipboard, and as such deserves a wide circulation and use.

H. E. EGGERS.

PRACTICAL BACTERIOLOGY, BLOOD WORK, AND ANIMAL PARASITOLOGY, by E. R. Stitt, A.B., Ph.G., M.D., Medical Director, U. S. N. Fifth edition. Philadelphia: P. Blakiston's Son & Co.

The author of this little book is to be congratulated upon his ability to arrange his subjects in such order, and to have them so concise and still carry all the information needed. I know of no book of its size that approaches it as a handy book of reference. Each chapter is complete and filled with meat. It is to be highly recommended for field work and laboratory use.

H. R. OLIVER.

THORACIC SURGERY, by S. I. Meltzer, M.D., LL.D., New York. *Med. Record*, July 6, 1918. (President's Address at the meeting of the American Association for Thoracic Surgery, Chicago, June 10, 1918.)

The launching of any newly created National Medical Society is always an event of more or less national pride as well as importance. The birth of the new association for thoracic surgery, under the presidency of a physiologist of the order of magnitude of Dr. Meltzer, renders it of quite special significance in that it is evidence of a recognition by its members that the principles and practice of this new specialty in surgery must ever be controlled and guided by the peculiar functions of the organs to which the thorax gives shelter. Hence, also, a greater familiarity with the physiology of the thoracic contents on the part of the members of this new branch of surgery, than that possessed by the general surgeon up to the present, must form a fundamental requisite to the normal growth, to the successful work of this new specialty in the profession. For it may be said, without fear of contradiction, that in no other special branch of surgery does the knife of the surgeon ever come in such close contact with such immediate and such vitally important organs as are contained in the thoracic cavity. On this physiological conception the success of thoracic surgery must stand or fall.

For the military surgeon this new specialty is of perhaps greater significance and promise than for the civilian operator. Its immediate and rapid growth will be greatly desired and eagerly looked forward to in this quarter.

To the reviewer it appears as if the very beginning of the long-hoped-for, better times now dawning for thoracic surgery was made when Metzer introduced his device for intratracheal insufflation. The processes implied in the maintenance of artificial respiration in the, otherwise, collapsed lung of an opened thoracic cavity and that of ether-anesthesia, enabling the operator to handle a beating heart with comparative safety, would signify to him the very breath of life blown into the still-born baby of the new surgical society and of life itself to our poor patients afflicted with gunshot wounds through the chest cavity.

H. G. BEYER.

OFFENSIVE FIGHTING. Sixteen original and detailed drawings in color, by Major Donald M. McRae, M.C., I.R.C. Philadelphia and London: J. B. Lippincott Company, 1918.

"If any enemy wounded are found (in the trench) they should be bayonetted, if sufficient prisoners have been taken (say 3)." "If a German is met do not stop to order him to put up his hands . . . fire or lunge at once." Such instructions may seem murderous until one reads: "No live enemy should be left lying in the trench behind the party, as wounded Germans who are spared have the habit of shooting our men in the back. There are usually bombs and casualties' rifles lying around so that it does no good to disarm them." Again: "If his hands are not already up he has the same chance to kill you that you have to kill him."

In the same graphic way the author sets forth the duties and latest practice of infantry as developed in the first line trenches. While these instructions should be studied hard by officers, the civilian reader of the daily war news would

greatly supplement his knowledge by a careful reading of this work; he would learn exactly what is meant by consolidation of mine craters, trenches and other positions; the object and methods of conducting ternch raids; what scouts, patrols and listening posts are, and how they obtain and report information to the Intelligence Service, which guides all the operations of the armies. The use made of airplane photographic maps is explained. Incidentally one learns what the signal lights and flares are, also how the scouts, auto-riflemen, bayonet men, boomers, rifle grenadiers and moppers-up carry out each their part in the offensive and how the wonderful coöperation between the infantry and the artillery and machine guns provides not only the preparation for the assault but also the barrage, that protective curtain of fire, the infantryman's "best friend"; although it may occasionally injure him it protects him from far greater injury by the enemy.

Major McRae had three and a half years training at West Point; of his two years in the Canadian infantry he served one year at the front in France, was awarded the British Military Cross for gallantry; was instructor at the English Warfare School, delivered lectures there and at various camps in the United States upon the subjects covered in this book, which is approved by the War Department for the use of our Army.

CLINICAL AND LABORATORY NOTES

IODINE IN TUBERCULOSIS

By Captain EDWARD VON ADELUNG, M. C., U. S. Army, and PHILLIP F. ABBOTT, M.D.

The following observations were made during 1917 and 1918 at the Clinic of the Alameda County Society for the Study and Prevention of Tuberculosis, an institution supported by county and city appropriations together with private subscriptions.

While iodine is recognized as a most useful bactericide, and widely used both in medicine and surgery, its employment in pulmonary tuberculosis is generally condemned as dangerous because of its reputed power of solving and dispersing fibrous tissue. As fibrous tissue is credited with protecting the body against local tubercles, the danger of dissemination of the bacilli by iodine therapy has become almost axiomatic. Rather than deny this supposed action on fibrous tissue—a question that has been raised by others—I have chosen to test clinically the noxiousness of iodine in phthisis.

The method selected was to give French tincture of iodine (of which one minim contains gr. 1/10 of iodine), beginning with one drop (in water or milk) three times a day after meals, increasing the dose by one drop per day. Thus given, the iodine soon appears in the sputum as tested by the color reaction with calomel, but no toxic effects were seen even when high doses were reached.

The seven cases treated included males and females, all ambulant. All presented advanced lesions save two, one of which was moderately advanced, while the other was early but not incipient. Excepting cases 5 and 7, all yielded tubercle bacilli. The two negative cases were diagnosed by radiograph, anamnesis, and physical signs. The period of treatment varied from two to nineteen months, and the maximum dose from 21 to 150 drops per day.

Inasmuch as the signs of this disease are easily modified by exercise, the working hours of the patients are included among the recorded data. (See table, p. 89.)

From this table it will be noted that, of seven cases treated, none lost weight, while three (though taking large doses) gained from 7 to 26 pounds. In three cases the effect of iodine was certainly harmless, as judged by cough, amount of sputum, presence of bacilli, night sweats, râles, and fever. No case spat blood. In-

EFFECT OF IODINE ON TUBERCULOSIS

Case	Age	Stage	Period, months	Maximum dose per day	Increase in weight	Cough	Amount of sputum	Sweats	Râles	Fever	Work hours	Wasser-mann	Tubercle bacilli
1	32	+++	7	66	None	Less	Less	Ceased	Same	Same	6	Neg.	Same
2	66	+++	19	150	20 lbs.	More	More	Ceased	.....	Ceased	8	Neg.	Same
3	39	+++	11	48	26 lbs.	Same	Same	Same	Same	Same	2–8	.....	Same
4	43	+++	4	40	7 lbs.	Same	Same	Same	Disappeared	Same	.....	Neg.	Dis-appeared
5	17	++	2	21	None	Same	Same	Same	.....	Same	8	Neg.	Same
6	36	+++	2	32	None	Same	Same	Same	Same	Same	4	Neg.	Same
7	31	+	2	24	None	Same	Same	Same	Same	Less	6	Neg.	Same

deed fever disappeared in Case 2, cough improved much in Case 1, and night sweats ceased in Cases 1 and 2, notwithstanding that all the patients exercised and that most of them did a fair amount of work, two to eight hours a day. Most of the patients declared that they felt better.

Conclusions.—(1) Though the series of cases is short, it seems to indicate that iodine is not necessarily harmful in pulmonary tuberculosis, when given in graduated doses, well diluted, after food.

(2) This series is not regarded as a test of the curative value of tincture of iodine.

ENORMOUS ADRENAL HEMATOMA

By Captain ARTHUR S. BRUMBAUGH
Medical Corps, United States Army

Clinical History.—An infantryman, 27 years of age, entered the hospital July 20, 1918, with cellulitis of the distal phalanx of the third finger of the right hand. It was immediately incised and drained and the wound gradually healed until August 15, when he developed a "rheumatic cold." August 16, the inflammation again lighted up and the finger was re-opened on the 18th. August 21, the patient developed a follicular tonsillitis with chills, temperature ranging between 101° and 105° F., and slight cough. A toxic erythema, consisting of macules, varying in size from a pin-head to a dime, appeared on the face, knees and legs. August 25 he complained of pain in the left side. August 28 he had severe pain in the muscles in the sacral region, requiring relief by sedatives. August 29 he still complained of pain in the abdomen and in the right thigh. The abdomen was somewhat distended, his color pale and facies dull and listless. August 30 the abdomen was more distended but not very tender, the pallor was increased, the pulse became progressively weaker, and the patient expired.

Since August 15 the temperature had ranged from normal to 104° F. The pulse was proportionately slow, ranging from 60 to 104.

Autopsy Record.—The subject is a large, white adult male. The anterior surface of the body is pale with a faint yellow tinge. Running diagonally across the palmar surface of the distal phalanx of the right ring finger there is an incised wound 3 cm. in length, almost healed. The tip of the finger is shrunken and red.

Body cavities.—On opening the abdomen a thin sero-sanguinous fluid is found in the peritoneal cavity. On the left side of the abdomen, glistening through the peritoneum, is found an enormous

hematoma in the descending and transverse mesocolon. The hematoma extends from the pelvis to the splenic flexure, pushing the spleen up into the vault of the diaphragm, thence transversely across the abdomen post-peritoneally to a point in the epigastric region 4 cm. to the right of the median line. The hematoma raises the colon from its normal position anteriorly a distance of 10 cm. It extends two-thirds of the way around the lumen of the bowel undermining the serous coat, only the anterior third being normal in color. The volume of extravasated blood is estimated at not less than 3 liters. It is found anterior to the left kidney infiltrating the anterior portion of the capsule of the kidney, while its origin is in the substance of the mesial portion of the left adrenal gland, splitting the gland longitudinally.

Other abdominal organs.—The spleen is soft, greyish-red in color, measures 19 by 12½ by 3 cm., and weighs 478 grams. On section the Malpighian corpuscles are very large and distinct, and the pulp is soft and scrapes off readily. The parenchyma of the kidneys is swollen and opaque, and studded with minute hemorrhages.

Thoracic organs.—On section of the lungs the cut surface is found to be practically bloodless. The cardiac end of the esophagus for a distance of 4 cm. above the diaphragm is infiltrated with hemorrhage which has extended from below through the diaphragm.

Anatomic diagnosis.—(1) Acute splenic tumor; (2) parenchymatous degeneration of the kidneys; (3) enormous hematoma arising from the left adrenal gland infiltrating and limited by the descending and transverse mesocolon.

Cause of death.—Retro-peritoneal hematoma, complicated by septicemia.

Bacteriological findings.—Hemolytic streptococcus was found in the heart blood at autopsy, and from blood culture before death.

Histologic findings.—There is a diffuse leucocytic infiltration of the reticular layer of the cortex and medulla of the adrenal gland, especially marked about the blood vessels of the medulla, the walls of some of the veins being noticeably thickened by infiltration.

The cortical tubular epithelium of the kidney is granular and many of the tubules are filled with blood. There are also numerous small interstitials between the tubules.

Comment.—Adrenal hematomata are not uncommon, but usually do not attain large size. Mallory[1] states that they reach the size of a hen's egg. The cause doubtless was the streptococcic invasion of the vessels of the medulla of the gland. It is quite probable that,

[1] Mallory. "Pathological Histology," page 652.

as extravasation progressed in the mesocolon, it mechanically raised the colon forward and severed the vessels supplying this viscus, thus producing a vicious cycle which continued until the patient was exsanguinated. The slow pulse throughout may be attributed to impairment of the adrenal function due to early involvement of the gland.

MUMPS MENINGITIS—REPORT OF TWO CASES WITH AUTOPSY FINDINGS

By Captain WILLIAM R. LARKIN
Medical Corps, U. S. Army

Mumps meningitis is of particular interest at the present time when large bodies of men are concentrated in various army camps, and when the early recognition of meningeal disease is of vital importance to the military service. Text-books have taken but little recognition of this complication of mumps. Most of the standard works on medicine do not mention it at all, or content themselves by merely stating that this complication may occur. Thus, for example, one of the newest and widely read works mentions mumps meningitis in a single sentence, adding in a paragraph that the condition is never fatal. In this country mumps meningitis has been studied chiefly by George Acker and Julius Kaunitz. The latter points out that, since most patients recover after a few days, it is very probable that the milder cases of meningeal irritation are probably not recognized and that this, probably, accounts for the fact that so few cases are on record and that so little is known of this complication. It is likewise most probable that the incidence of this complication varies considerably in different epidemics; thus, in our own epidemic of some 2,400 cases of parotitis, meningeal complications were recognized in only two. Acker states that, in 1,705 cases observed, there were 158 cases of meningitis, but that this does not give the true proportions, as many cases pass unnoticed. Massary, Tockman, and Luce found meningitis almost constantly in 635 soldiers afflicted with mumps, while Fiessinger reported five cases of meningitis in 41 cases of mumps. The reason for this wide variation of incidence may be due to observation, or, and this is more likely, due to the difference in the virulence and invasive power of the virus causing meningitis.

Historical.—According to Acker, mumps meningitis was first recognized by Hamilton in 1758, who recorded the death of a man aged 22, from meningitis complicating mumps.

Symptoms.—The meningeal symptoms rarely precede the attack of parotitis, but usually make their appearance two to five days after the parotid swelling. In some instances the meningitis occurs later. The onset and the course of the complications vary considerably, sometimes a moderate fever, headache, insomnia, and general discomfort mark the disease, but occasionally severe symptoms are present, such as sharp rise in temperature, rigidity of neck, Kernig's sign, pupillary changes, disturbances of sensation, involvement of cranial nerves, delirium, convulsions, muscular spasm, paralysis, and occasionally cutaneous hyperesthesia.

Anatomic lesions—But few autopsy records are present and detailed anatomic studies are rare, since the disease appears to be of relatively low mortality. Generally speaking, the changes found are those of lymphocytic and edematous meningitis associated with some encephalitis. The bacteriology of the disease is as yet obscure. A diplococcus has been isolated from the blood and the parotid gland, but apparently no organisms have been found in the spinal fluid. Lately, M. Wollstein stated that mumps was due to a filterable virus with which she was able to produce the disease.

Diagnosis.—It need hardly be pointed out that in an army camp it is of vital importance to recognize early the true nature of any meningeal infection. The more common diseases sometimes accompanied by meningitis are epidemic meningitis, streptococcus pneumonia, influenza, and tuberculosis. There are certain clinical symptoms more or less characteristic of each, but the final criterion lies in the examination of the cerebrospinal fluid for type and count of cells, and bacteriology, which are here of more diagnostic value than the chemical tests. The characteristics of the spinal fluid in the common types of meningitis may be grouped in the following table:

	Mumps	Tuberculosis	Influenza
Appearance on withdrawal	Usually clear	Usually clear	Cloudy.
Appearance after 14 hours	Fine white sediment.	"Spider Web" or "Velum."	Yellowish white sediment.
Cell count	200	200	500.
Type	Lymphocytes	Lymphocytes	Leukocytes
Bacteriology	Sterile	B. tuberculosis	B. influenzæ.

	Pneumonia	Streptococcus infection	Epidemic meningitis
Appearance on withdrawal	Turbid	Turbid	Turbid.
Appearance after 14 hours	Heavy purulent	Very purulent	Heavy purulent sediment.
Cell count	500	500	500
Type	Leukocytes	Leukocytes	Leukocytes.
Bacteriology	Pneumococcus	Streptococcus	Meningococcus.

It must be pointed out, however, that variations from the above may occur. In this connection it is of interest to note that Dopter states that in simple mumps the spinal fluid is normal in cellular elements.

Case I

B. K. H., Pvt. Cooks and Bakers School, Q. M. C., aged 31, white. In service three years. Admitted to hospital February 21, 1918.

History.—Family history and previous personal history unimportant. Claims that he has been in good health until age of twenty-eight, at which time he suffered from mumps.

Examination.—When admitted to hospital both perotid glands were moderately enlarged. Temperature 99° F., pulse 80, respirations 22. No other organic changes. On the third day after admission patient appeared dull, and had not eaten. On the evening of the 24th he was mildly delirious and showed Kernig's sign. The following day delirium and Kernig's sign were more pronounced. First lumbar puncture apparently clear fluid under pressure, unfortunately mixed with some blood. Examination showed globulin present, 260 cells per c.mm. Second lumbar puncture, made during the night, showed clear fluid, 200 cells per c.mm.; differential count polymorphonuclears, 40 per cent; lymphocytes, 60 per cent. On the following morning, February 26, number of cells 51 per c.mm., globulin present. On the 27th, patient was not quite so delirious and showed slight general improvement, but on the following day he became stuporous. Examination of the eye grounds showed double choked disc. Blood pressure systolic 140, diastolic 80. Retention of urine. Lumbar puncture gave 130 cells, of which 61 per cent were polymorphonuclears and 39 per cent lymphocytes. White blood count 12,600. Differential count, large mononuclears 9, small mononuclears 3, transitional 1, eosinophiles 1, neutrophiles 86. Urine analysis negative. Temperature from the 25th to to 28th normal, pulse normal until 27th, on which date it rose to 100, and shortly before death to 150.

Autopsy.—At autopsy an early bronchopneumonia, acute diffuse splenitis and acute parenchymatous nephritis were found. On removing the brain an extensive accumulation of slightly turbid fluid in the cisterna magna was observed. The pia-arachnoid was congested. In many places a perivascular exudate was seen in the form of grayish-yellow lines following the course of the blood vessels. The ventricles were somewhat distended. The fluid was clear. The ependyma was slightly granular. Cultures (aerobic) from the perivascular exudate and from the spinal fluid were negative. Microscopic sections showed the pia-arachnoid densely infiltrated with large and small mononuclear cells. The infiltration was definitely perivascular, but also extended into the areolar tissue and cortex. Similar cells were adherent to the arterial intima.

Case II

W. F., Pvt. Co. 29, 8th Bn., 159 Depot Brigade, aged 28. Race, white. One month in the service.

Family history.—Father died of typhoid fever, mother of pneumonia. One sister living, one sister died of pneumonia, three brothers living, one dead, cause unknown.

Personal history.—Construction worker. Habits as to alcohol negative.

Medical history.—No diseases of childhood. Gonorrhea in 1916. Was admitted to the hospital on April 13, 1918. General condition on admission good. Parotid glands on both sides greatly enlarged. Temperature 99° F. Special senses negative. The parotitis ran a typical course up to the 18th, when right orchitis developed. On the morning of April 28 the ward surgeon noticed that the patient did not get up, but did not complain of pain. He appeared stupid, answered questions slowly, but could be aroused by shaking or calling. No stiffness of neck, Kernig's sign not present, pupils reacted slowly. By evening there had developed some stiffness of the neck, a left-sided Kernig, spasticity of left leg and right arm. Babinski present on left side, questionable on right. Clonus slight but not persistent. Right pupil reacted more promptly than left. Abdominal reflex present but not active. No scaphoid abdomen. Deep reflexes in extremities exaggerated. No deviation of eyes but fundus congested. No evidence of other cranial nerve involvement. Patient was seen in consultation with the neuropsychiatric staff, which confirmed the findings and the diagnosis. Blood pressure systolic 115, diastolic 105. Frequent involuntary urinations. Spinal puncture was made and 60 c.c. of clear fluid obtained at high tension. Globulin absent, cell count 19. A blood count made on the same date showed a leukocyte count of 19,000. The patient was seen that evening by Major Hamburger, Chief of the Medical Service, who made a complete physical examination, and heart and lungs were found normal. It was impossible to obtain a specimen of urine by catheterization due to urethral hemorrhage and involuntary micturition during p. m. On April 29, the following morning, another spinal puncture was made and 40 c.c. of clear fluid removed not under increased pressure. Culture was negative. Cell count was 18. Globulin positive. The general condition and reflexes of the patient were about the same as on the preceding day, excepting that he was more comatose and a slight increase in the rigidity of muscles of extremities occurred. Examination of the eyes by the oculist showed the fundus normal; the edges of disc slightly indistinct, otherwise normal. On the morning of the 30th another spinal puncture was made and 50 c.c of clear fluid removed under very slight pressure. Examination of same showed no Gram-negative diplococci. Blood culture was taken and reported negative. The general condition of the patient remained the

same as on entering the ward, excepting a slight increase in Babinski and ankle clonus. Reaction of pupils sluggish. Circulation and respiration remained good.

On the morning of May 2 another blood culture was found negative. Kernig's sign absent. Eyes sluggish. The patient was somewhat brighter and responded slightly at the mention of his name. From then until the 5th the patient gradually improved and his mentality slowly cleared. A white blood count on the 3d showed leukocytes 10,300. The right arm, which up to that time was rigid, now began to relax slightly and gradually improved so that on May 14 he had regained normal use of his arm and left leg, and his mind appeared perfectly clear. Patient was allowed to sit up for a while on May 16, and on the 19th he was able to be on the porch. On May 21 the patient complained of a slight frontal headache and of being a little dizzy. These symptoms cleared up in 24 hours. The patient was transferred to a general medical ward on May 23 and finally to the convalescent ward on June 3. Throughout the critical illness of the patient fever never went above 100°, except on two evenings (104.4° on the 28th, 102° on the 30th), and the pulse rate at all times averaged between 80 and 90, respirations only dropped to 16 on one occasion, otherwise averaged between 18 and 20. Urine analysis May 7, albumen trace, sugar negative, leukocytes and small epithelium present. June 2, albumen negative, sugar negative.

A CASE OF REFLEX PARALYSIS OF BABINSKI DUE TO REFRIGERATION

By 1st Lieutenant ORLANDO F. SCOTT
Medical Corps, United States Army

Reflex paralysis, a phenomenon described by Babinski in 1916, is a most peculiar condition, requiring close study of a series of both pure and mixed cases before its characteristics can be definitely isolated as an entity and absolutely differentiated diagnostically. In most instances thus far recorded this condition is the result of slight trauma, usually about the affected part; it may be only a minor flesh wound or an abrasion of the skin. In the majority of cases there is no injury whatever near any nerve trunk that could cause concussion or "spread" of the impacting force; nor is there blood vessel injury. In other instances there may be slight injury to one of the fingers of the particular extremity involved. Babinski does not mention, in any of his recent writings, a case of the phenomenon in the absence of definite trauma, no matter how slight.

The case has been studied very thoroughly and carefully by me, and occuring, as it does, in a long series of organic, pithiatic, ischemic and reflex paralyses, both simple and complicated, I am able to prove it beyond question as a case of the Babinski type:

Patient—Private "D," F. R. C., U. S. A.

Past History—Twenty-four years of age; strong; healthy; well nourished; weight 150 pounds; ordinary diseases of childhood; denies specific infection; married, one child living and healthy.

Injured April 26, 1916, by a blow from an aeroplane propeller which struck him on the left forearm causing a compound fracture of both bones, middle third. There was no nerve involvement at this time *since patient could move all of his fingers when the splint was removed; he had no wrist-drop, no numbness or "dead" spots on the skin of his left forearm, hand or fingers.* After this injury of left forearm, he states that the skin of his left hand and fingers recognized the sense of touch as sharply as on the right side.

Present Complaint—Patient states that he contracted parotitis on board ship eleven days before she was torpedoed. On February 5, when the *Tuscania* was torpedoed, both of his parotid glands were very much swollen. States he did not injure his left hand, arm or shoulder in any way, as he got into the water and that he was only in the water a very few minutes when he noticed a numbness and tingling of his left arm and hand, with pain "shooting" down into his fingers. This sensation continued for a period of about forty-five minutes, when he was picked up by a life boat. On getting into the boat he thought the numb feeling was due to the cold water and he tried to pull an oar, but the pain became so great in the left forearm and hand that he collapsed. At the end of almost four and one-half hours, when he landed, he was immediately removed to a local hospital, where he remained under treatment for eighteen days for parotitis. During all this time the pricking and tingling with weakness persisted in his left forearm and hand. As the parotitis had cleared up, he was sent to another hospital for diagnosis and treatment of the condition in the left forearm and hand. His trouble was diagnosed as neuritis and he was sent back to duty. He continued on active duty, his hand continually growing weaker and getting thinner, "wearing away," as he termed it; then his ring and little fingers began to flex on his palm. The medical officer told him that he had a little "rheumatism" and would be all right shortly. Finally the condition came to the notice of his commanding officer; he was transferred to a special hospital for nerve injuries, where I examined him just ten weeks after the onset of his trouble.

Present Examination—The skin of the left hand is of a cyanotic or salmon pink color, smooth and glossy. The nails appear rounded and shiny and are beginning to become grooved transversely. The metacarpo-

phalangeal joints of the second, third, fourth, and fifth fingers are hyper-extended; the interphalangeal joints of the second and third are slightly flexed and those of the fourth and fifth fingers more markedly flexed; the distal phalanx of the middle finger is very slightly flexed; the distal phalanges of the ring and middle fingers are more markedly flexed; the thumb stands abducted; the dorsal interossei are markedly atrophied. Pressure over the dorsum of the hand steadily for a few moments causes a spot of local anemia which persists for several moments.

Palpation—Deep palpation and rolling of the ulnar, median and musculo-spiral nerves causes a tingling distally. Pinching of the skin on both dorsum and volar surfaces elicits normal feeling until level of wrist joint is reached, when pinching becomes so dulled that it is barely perceptible over both surfaces of the hand and fingers.

Percussion—Direct percussion of the muscles shows them to be hyper-excitable to this mechanical stimulation, producing a slow movement of great amplitude (as compared with the sound side). *This hyper-excitability increases when the hand is cooled and decreases when it is heated.*

Tendon Reflexes.—Biceps, triceps, supinator longus, radial extensors, pronator radii teres, and biceps all slightly exaggerated.

Sensory Examination: To Pin Prick (Protopathic)—The skin of the forearm, both surfaces, responds to pin prick and its normal sharpness is preserved, but when the level of the wrist joint is reached, pin prick sharpness is markedly dulled and some spots are totally anesthetic. This sensory disturbance extends over both surfaces of the hand corresponding approximately to the part covered by a glove.

(Note. Patient states his entire left hand and fingers were *totally anaesthetic* immediately after he was torpedoed, and it is only very recently that the skin is becoming the least bit sensitive. It is to be remembered that this examination was made ten weeks after the patient's exposure.)

To Cotton Wool (Epicritic)—Glove area of sensory disturbances corresponds almost identically to that of pin prick.

To Deep Pressure—Dull in entire glove area.

Bone Conduction—Markedly diminished over metacarpals and phalanges of fingers and thumb, slightly diminished over carpal bones.

Muscle Sense Position—Much disturbed in all five fingers. Astereognosis present.

Hypothermia—3° C. lower than opposite side.

Hand Grip—Right hand 320; left hand 90, 60, 50, showing paresis and rapid fatigue of the flexors.

Electrical Reactions—Muscles respond to faradic and galvanic currents with hyper-excitability. Ischaemia produced by the application of an Esmarch constrictor allows the fingers to be completely extended without effort. Radial pulses appear equal. X-ray shows decalcification of skeleton of affected hand.

Treatment—Massage and faradization combined with some psychotherapeutic suggestion to prevent secondary organic contractures and to maintain tonus and contractility of the muscles.

Examination May 24, four weeks after initial examination elicits the facts that the skin is fast resuming its normal hue and texture, the interossei are filling out and restoring normal contour to the hand; the abnormal flexion of the fingers has almost disappeared and the paresis, as shown by the hand-grip test, is disappearing: Right hand 340; left hand 100, 70, 70, 60.

There is less sensory disturbance in the glove area. No marked tingling when the skin is pinched; the muscles are not as hyper-excitable to mechanical stimulation.

From the patient's description of his condition before he came under my observation and the comparison of the symptoms when I first examined him April 24, I have no hesitancy in stating that he is rapidly recovering from this lesion.

This case is, therefore, one of reflex paralysis, described by Babinski, *"Not due to trauma, but to refrigeration"*—an unusual and rare cause. The fact that he was seen by a number of medical officers without the condition being recognized, warrants me in stating that, *unless such cases are more speedily diagnosed, "organic contractures" will quickly develop, crippling the patient for months or years, if not for life.* The reflex type of paralysis is much more prevalent than is thought, and I have now under observation a number of cases where organic contractions have caused serious complications through failure of proper diagnosis. In spite of strain put upon the medical service under war conditions, these cases *must be diagnosed early* if we are to conserve our man power to fullest efficiency.

This case is of especial interest because of the rapid recovery under proper treatment. Babinski lays great emphasis on the fact that this type is very intractable, responding stubbornly to treatment, and pursuing a protracted convalescence. I am convinced from my own observations in a number of these cases that the *reason they do not respond to therapeutic measures rapidly is because the conditions are not recognized sufficiently early before secondary organic changes and contractures have occurred.*

Résumé and Diagnosis—

1. Hyper-excitability of muscles to mechanical stimulation.
2. Hyper-excitability of muscles to electrical stimulation with faradic or galvanic currents—increased when hand is cooled, decreased when hand is warmed.
3. Increased reflexes.
4. Marked vasomotor changes of skin and nails.

5. Glove type sensory disturbances.
6. Markedly diminished bone conduction.
7. Decalcification of bones.
8. *Local ischaemia artificially produced causes a disappearance of the contractures.*
9. Marked atrophy of the interossei.
10. Hypothermia.

I am deeply indebted for the moral support and kind assistance of Col. Percy Sargent, R. A. M. C., and Col. E. Farquhar Buzzard, R. A. M. C., and to Fleet Surgeon L. M. Levick, R. N., for electrical examination of this patient.

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THE EXAMINATION FOR HOOKWORM

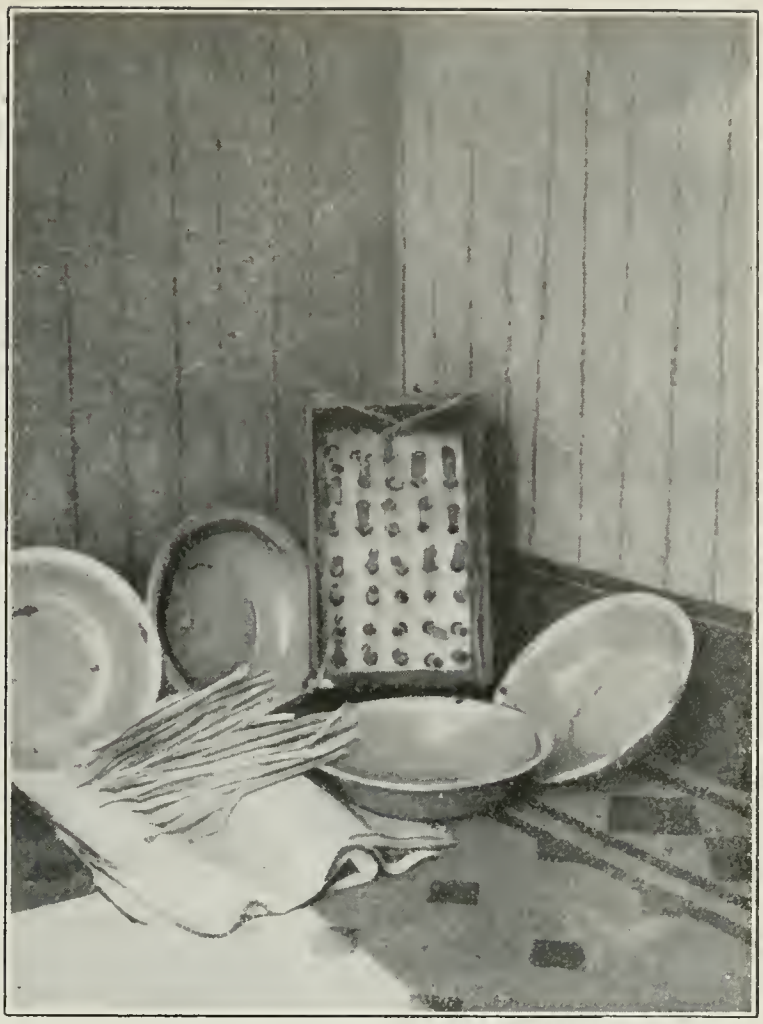
By Major E. L. DE LANNEY
Medical Corps, United States Army

(With two illustrations)

The examination of a large body of men for hookworm is a task dreaded by many military medical officers. The work of collecting the feces, of keeping the specimens separated and, if doing post work, of examination, appears a very difficult task.

It was with some dread that I undertook the examination of the feces of 600 men in an army post where I had only one medical assistant. However, after working out a plan of procedure, the task was found to be anything but difficult or disagreeable, and for the assistance of those who have this work to do, this plan will be described in detail.

1. After getting a certified list from each company of the men that were enlisted or had previously lived in hookworm-infected districts, a letter was written to the company commander through the regimental commander requesting: That the men enumerated from his company, accompanied by a noncommissioned officer, be



Paraphernalia Used to Gather Specimens.

Hookworm Squad.

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ordered to report at the infirmary at 8 p. m. on a given day, and that after the men returned they would be confined to their barracks until ordered released by the medical officer. That an armed guard be on duty at the latrines used by the company the following morning from 4.30 a. m. until ordered relieved.

2. On the prescribed evening, each man reporting was given a tablespoonful of castor oil and returned to his barracks in charge of the noncommissioned officer.

3. One noncommissioned officer and two privates, Medical Department, instructed in the method of gathering feces, were to report at the latrines used by the company at 4.30 a. m. the following morning.

4. *Method of collecting feces:*

(*a*) *Paraphernalia.*—Four washbasins, g. i.; 100 sheets of paper 18 inch by 18 inch (old newspaper); one test-tube holder for 50 test-tubes; 50 test-tubes each containing 10 c.c. of NaCl sol. (N/10); 100 slivers of pine wood, about 8 inches long; 2 wax pencils; a certified list of the men who were treated with castor oil the night before.

(*b*) *Technique.*—The next morning, as each man came down to defactate, he was assigned a number opposite his name and then handed a g. i. basin in which had been laid a piece of 18 inch by 18 inch paper on which the same number was written in the corner, and he was ordered to defecate on the paper in the pan. After defecating, a piece of feces about the size of a lima bean was picked up on the sliver of wood by one of the men of the Medical Department.

The sliver of wood and feces were then placed in the test-tube. A corresponding number was written on the test-tube, which was returned to the rack. The soldier was next instructed to slide the remaining discharge, paper and all, into the latrine. The pan was then ready for the next man, having been kept clean by the paper.

(*c*) *Examination.*—When all the feces had been gathered (usually about 8 a. m.) the rack containing the test-tubes was taken to the laboratory for examination. The contents of the test-tubes were stirred with the wooden slivers so as to loosen the mass from the stick and break up the particles. The sliver was then put away to be burned. The test-tubes were left to stand an hour, after which the supernatant fluid was decanted. Two smears were then made from the residue, on a glass slide, and on each was written a number corresponding to the number on the test-tube, by marking with a wax pencil. These slides were then examined with a low

power for worms or their ova, and the results were checked opposite the man's name corresponding to the number on the slide and test-tube.

The method worked very satisfactorily and was very accurate. To avoid the possibility of error, a noncommissioned officer was constantly watching the marking and checking of the specimens. The slides were examined by one of the medical officers and about one hundred slides a day were examined without trouble.

The test-tube rack was a wooden box 12 by 12 inches, in which had been placed a false bottom of cardboard about 2½ inches above the true bottom. This false bottom had been ruled both ways with lines about 1½ inches apart. Where the lines intersected, a knife blade had been punched through the cardboard, thus making a crucial incision in which the test-tubes were pushed and remained upright.

I have found it essential to get the regimental commander's indorsement on letters of request for lists of men from hookworm-infected districts. Without this indorsement the company commanders are apt to be negligent in complying; the same is true of the request that the men report on a given date. It is important to post an armed guard at the latrine at the time of collecting feces; his presence will save much time and discussion in complying with the instructions given the men by the Medical Department personnel.

I have found it unnecessary to use the centrifuge in the examination as sedimentation is quicker when a large number is to be examined. There is less liability of error in checking results against individuals as the specimens do not leave the test-tube between time of collection and time of examination.

INSTRUMENTS AND APPLIANCES

OILING BY CAPILLARITY AND BY OIL-SOAKED SAWDUST IN MOSQUITO-CONTROL WORK

By MARK J. WHITE

Surgeon, U. S. P. H. S., Sanitary Adviser and Inspector, 8th Naval District

(With three illustrations)

Figure 1 shows the capillarity oiler. A quart can with push lid, which excludes the rain, is suspended from a stake by means of a wire passed through its sides at opposite points immediately below the lid. The stake is driven in the bed of the ditch and is sufficiently inclined to permit the wick to hang free without touching the side of the can. The wick is of 6-ply jute binder twine and about 18 inches long. Its proximal end is anchored inside the can by an iron nut, while its distal end hangs free in the water. The wick, previously oiled, is brought out the side of the can near its top through a hole made by raising a flap, which keeps out rain. These cans require refilling every four or five days. Light brown or black Mexican fuel oil or kerosene may be used. This method is employed to maintain continuous oiling for the purpose of preventing oviposition. It is recommended for use on slowly moving water in drainage ditches and streams, and on large, more or less permanent ground pools. Surface obstructions such as algae, fallen grasses, etc., have to be removed by raking in order that the oil may be spread. The distance between cans depends upon the surface to be oiled, and this is determined by observation. In the case of ground pools, cans are placed at several points about the edges of the pool so that, no matter what the direction of the wind, there will always be a thin film of oil covering the surface. In drainage ditches and streams the cans must be hung above the flood levels. These cans may be used on large, grassy, more or less temporary ground pools, as standing grass does not interfere with the spreading of oil. It is possible that a thin film of oil laid down in this manner might not be injurious to the rice plant the cultivation of which is reported to be attended by excessive mosquito breeding. For the prevention of oviposition a thin film of oil seems to be entirely sufficient, but for larvicidal purposes a thicker layer is desirable. This can be accomplished readily by placing surface obstructions across the water (Fig. 2) at from 50 to 100 feet apart, so as to collect the oil into a heavy layer where the larvae, fleeing as they do from the source

of the oil, will receive more rapidly lethal treatment. Some of them may pass beneath the narrow strips of wood laid across the current to arrest the oil, but they will be overcome in the next section, as each section is provided with a continuous oiler. In a body of water such as a borrowpit, the oil will accumulate on the lee side, and the windward side oilers will drive the larvae into the thick layer.

Figure 2 shows a drainage ditch with floating surface obstruction for collecting the thin film of oil into a thick layer. This float, which is an inch-square stick, is held in place by two stakes inclined downstream to permit the float to rise and fall. It is tied to the stakes to prevent touching either bank so as to maintain at either end a narrow, unobstructed way through which the excess oil may pass on into the next section. This float, by retarding the flow of oil, causes it to back up for a considerable distance and invade the grassy edges. It is used for this purpose, even where there are no larvae present, wherever the width or rapidity of the current tends to keep the oil in midstream. The figure shows the thick layer of oil at the float, and the two upstream oilers, one at the fence and one at the board walk. The oiler in the foreground belongs to an adjoining section. The grass growing in that portion of the ditch between the fence and the board walk retards the film of oil and causes it to spread out over the entire surface, while below the board walk, where there is no grass in the water, the oil is made to spread out to both banks by the obstructive float. Where it is not practicable to repair or reconstruct and maintain drainage ditches, these more or less crude devices will be found very serviceable in curtailing mosquito breeding.

Figure 3 shows the preparation of the oil-soaked sawdust. Oil is poured on the sawdust in the wooden box and thoroughly incorporated by the laborer. It is then transferred to the iron wheelbarrow and bucket for transportation. The oiled sawdust is distributed by sowing so that each particle acts as an oiling focus. This method is recommended for use on temporary collections of water in wagon tracks, hoof-prints, post holes, small boats, artificial containers, puddles and grassy areas in which rain-water stands. The sowing of oiled sawdust on algae-covered water is probably as effective as oil-spraying.

These two methods, utilizing discarded tin cans, binder twine and sawdust, require about 50 per cent less oil and 35 per cent less labor than do the drip-cans and knapsack oil-spraying pumps, and they have proven more efficient and satisfactory.

FIG. 1.—CAPILLARITY OILER.

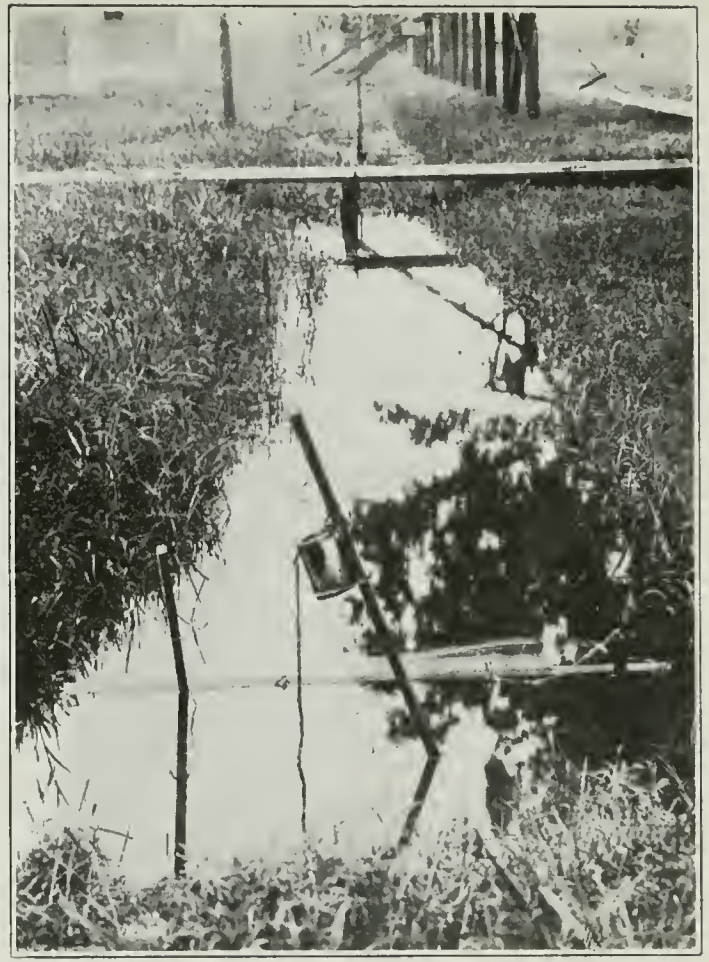


FIG. 2.—FLOATING OBSTRUCTION FOR COLLECTING THICK LAYER OF OIL.

(To face page 106)

FIG. 3.—PREPARATION OF OIL-SOAKED SAWDUST.

BATHING IN THE ARMY

By SIMON BARUCH, M.D.

(With three illustrations)

The Transactions of the American Association for Promoting Hygiene and Public Baths for 1917 contains an article on Bathing Facilities and Habits of Soldiers and Officers of the United States Army. Col. C. C. McCulloch, M. C., U. S. Army, treats this subject with fullness of detail and accuracy.

The fact that the style of shower bath universally used in the Army, because prescribed in the Quartermaster's Manual, is not mentioned indicates that in this mode of *prevention* of disease, as in its treatment, the physiological action of water is rarely taken into account. The antithermic ice treatment of sunstroke, for instance, is still recommended in most of our text-books, despite the fact that it has been proven by incontrovertible clinical observation to be the most fatal.[1] Just so is the vertical shower popular, despite the fact that it is contrary to physiological principles and common sense.

Wherein lies the superiority in refreshment, counteraction of fatigue, invigorating action of the shower over the tub, sponge or other bath? Obviously in the fact that its stream is or should be delivered with force upon the skin containing a vast nerve and vascular network. It is a well-known hydrotherapeutic principle that the effects of water upon the human body are based upon stimulation of the cutaneous nerves and vessels by temperature and mechanical action, and that they are influenced also by duration of the procedure. The vertical shower furnishes the temperature, but it is void of the important mechanical action because the latter is *exerted chiefly upon the hairy scalp. Since the water trickles from the latter upon the shoulders and flows in gentle rills over the entire body, there is no mechanical stimulation, no matter how strong the initial pressure may be.* The experienced hydrotherapeutist realizes that this is a serious loss, since the pressure under which water is delivered upon the skin is superior to its temperature as a stimulant, because the latter is liable to produce shock if diminished greatly, or scalding if increased. Moreover, experiments by Vinaj and Maggiora have demonstrated that water of a temperature not regarded as stimulating may induce an enhancement of muscular energy if driven under pressure upon the skin,

[1] Baruch: Principles and Practice of Hydrotherapy; Wm. Wood & Co., 1908.

as with the douche, even if delivered at a temperature not low enough to arouse reflex effects. A tepid shower delivered with force is as stimulating as a cool sponge bath, and the former is certainly more applicable. Moreover, it is a recognized therapeutic fact that the mechanical irritation produced by pressure neutralizes the possible depressing action of prolonged low temperature. For these reasons a very cold shower bath under strong pressure may be borne better than a tub bath of the same temperature, a fact which may be readily ascertained by taking a bath of even a few minutes.

Since warm water is rarely available in army bathrooms, the vertical shower when very cold, as in midwinter, falling upon the scalp, produces disagreeable if not painful sensations, while, if these are endurable, the cold water trickling from the head upon the body produces a chilling, depressing action.

All these objections to the vertical shower in common use may be readily removed by directing the shower obliquely so that it impinges upon the back, chest or sides of the body which may be successively exposed to the stream. For this reason I advised the oblique shower in all the public bathhouses which it was my privilege to introduce in this country many years ago. Thousands of these have been in constant use with the most beneficial results in affording not only cleansing but invigoration and alertness to the working people of all the larger cities of the United States. The reason is obvious. Falling with force upon the trunk, the shower produces a stimulation of the vascular and nerve supply of the skin, arousing reflex action from the central nervous system, with resulting refreshment of the organs of the body, which derive their functionating capacity from this source.

This difference is of immense importance to the soldier or sailor when depressed by heat, exposure to weather, loss of sleep, nervous tension in skirmish, battle or trench life. It is of course also worthy of recognition in camp life, because the correct shower enhancess physical strength and alertness, while the ordinary vertical shower only cleanses, unless it is too cold to be borne with comfort.

It has been my privilege to direct the attention of the Surgeon General's Office and of Major General Goethals personally, who encouraged me by the prospect of a change in the construction of army showers. The subjoined diagram explains the changes in space involved in the oblique shower and a method of overcoming all objection. It was designed for me through the courtesy of Mr. Eidlitz, Chief of the Industrial Housing Bureau, by Mr. Lionel Moses, to whom my suggestions were submitted. A simple mixer

must be attached to the main supply pipe, provided with a thermometer, and if the number of showers is large, a Leonard valve will be useful for maintaining a constant temperature. So soon as this point is reached the water must be turned off, the men ordered to take their place beneath the showers and the water turned on. The bath may last ten minutes or longer. Provision is made for a shower of 75° or less to furnish a bracing dash. From this the men may escape if they find it disagreeable. They will soon realize the refreshing and invigorating effect of this cold dash and will enjoy it accordingly.

The saving of time and water wasted in individual mixing of the water to reach a suitable temperature will amply repay the extra outlay for a mixer valve. It must be remembered that a shower is not like a tub bath in which the water remains in the tub while being regulated, while in the shower all the water not flowing upon the body, is lost. The change of all army showers merits immediate execution, the welfare of our defenders being of urgent import.

Note.—Since the above was written I have received the subjoined letter, which practically demonstrates the mechanical advantanges of the new shower-head arrangement, aside from its physiological advantages.

American Expeditionary Forces

10th October, 1918.

In replying please refer to this

No. $\frac{400,114}{6657}$

From: Chief Surgeon.

To: Major Harold M. Hays, M.D., Office of Surgeon, Base Section 3.

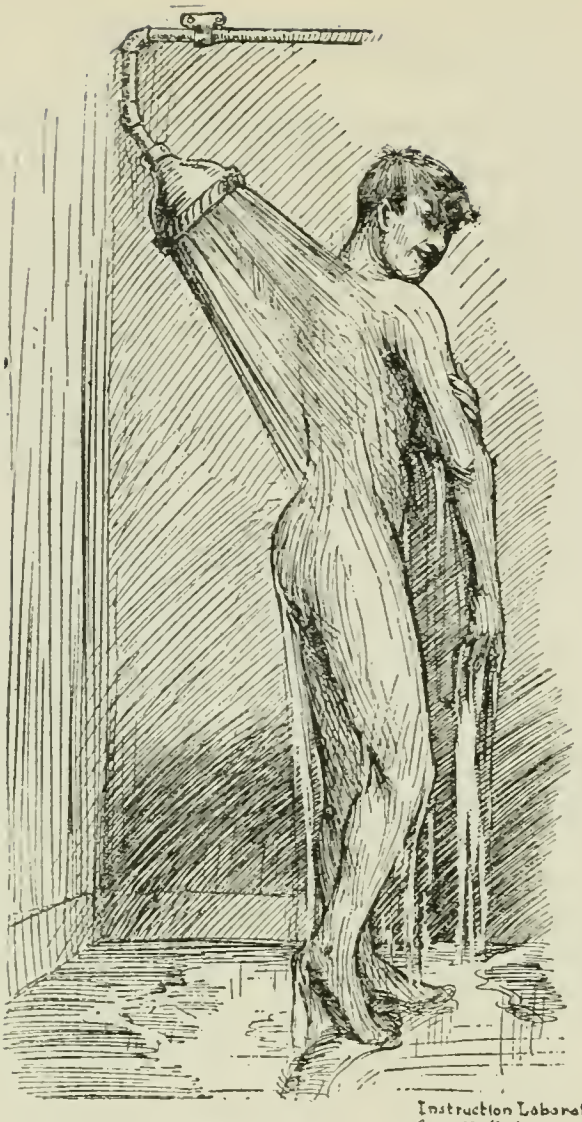
Subject: Plans for Shower Baths.

1. Receipt is acknowledged of Plans for Shower Head layout devised by Dr. Simon Baruch, which you have transmitted to this office.
2. There is no question that this ingenious method will result in a considerable saving of pipe, space assigned to shower room, as well as fuel to maintain temperature of water in pipes.
3. Plans indicating this method will be drawn up and made part of the booklet "Sanitation in War" prepared in this office, with due credit given to Dr. Baruch.
4. It is desired that you express the appreciation of this office to Dr. Baruch, and kindly forward him one of the booklets mentioned in paragraph 3, a copy of which is inclosed.

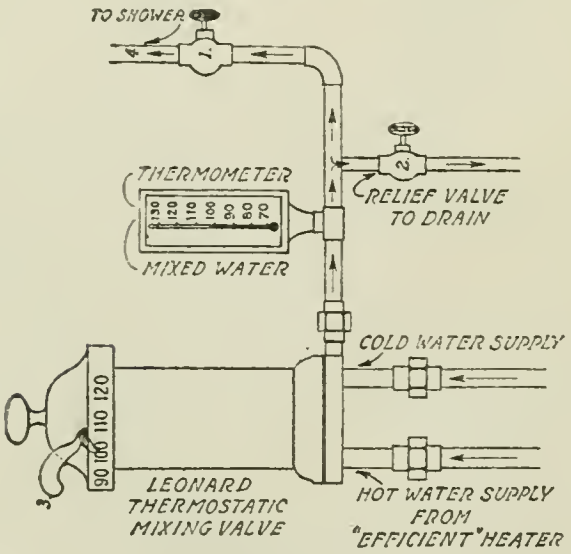
For the Chief Surgeon.

(Signed) G. E. Russell,

1st Lieut. San. Corps.



Instruction Laboratories,
Army Medical Museum, I.M.

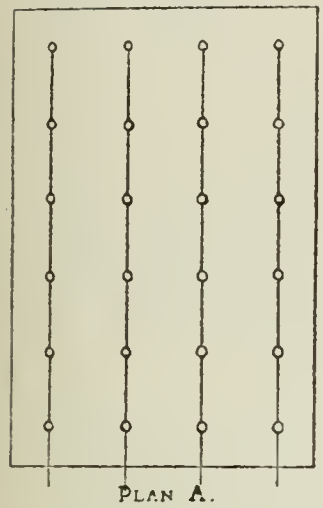


Close Valve 1, open Valve 2, open Lever 3. When fluctuation ceases and thermometer shows steady temperature of 103° F. open Valve 1 and close Valve 2. This admits mixed water to all showers 4.

Between the quadruple shower heads valves may be provided to permit shutting off those not desired. These valves are omitted in drawing.

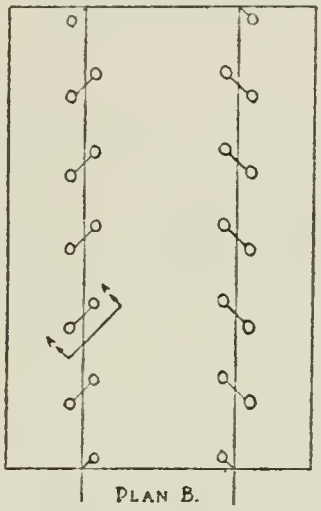
Typical Plans of Shower Rooms With 24 Shower Heads. ¼ Inch Scale.

24 Seperate Heads, Vertical Shower



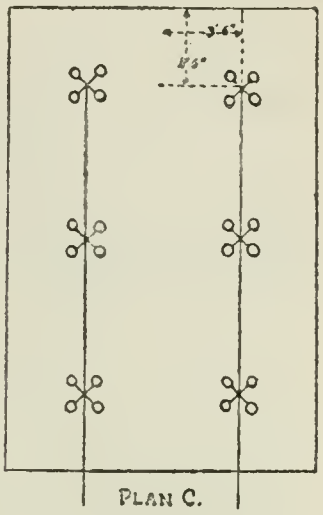
Plan A.

Heads In Pairs, Inclined Shower

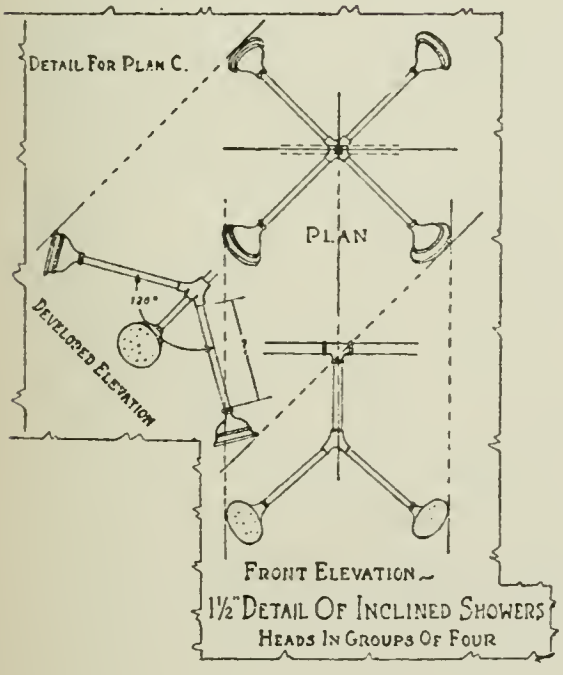


Plan B.

Heads In Groups Of Four, Inclined Shower



Plan C.



1½" Detail Of Inclined Showers
Heads In Groups Of Four

Details Of Showers By
The J. E. Mott Iron Works
Trenton, New Jersey

Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

First Lieut. David Abshire, M. C., U. S. A.
Died October 5, 1918.

Major Albert C. Bising, M. C., U. S. A.
Died August 1, 1918.

First Lieut. Hugh Z. Browne, M. C., U. S. A.
Died October 22, 1918.

First Lieut. Millard Clark, M. C., U. S. A.
Died September 30, 1918.

First. Lieut. William F. Craig, M. C., U. S. A.
Died September 26, 1918.

Col. Charles E. Doerr, M. C., U. S. A.
Died October 3, 1918.

First Lieut. William J. Ferguson, M. C., U. S. A.
Died October 12, 1918.

First Lieut. Morris Finkelberg, M. C., U. S. A.
Died September 15, 1918.

First Lieut. Samuel Goodglick, M. C., U. S A.
Died November 8, 1918.

First Lieut. Robert E. Hearn, M. C., U. S. A.
Died October 18. 1918.

First Lieut. Roy W. Johnson, M. C., U. S. A.
Died October 1, 1918.

First Lieut. Emil King, M. C., U. S. A.
Died September 12, 1918.

First Lieut. Edward K. Lubin, M. C., U. S. A.
Died October 26, 1918.

First Lieut. Harry S. Marcley, M. C., U. S. A.
Died November 18, 1918.

First Lieut. George R. Pretz, M. C., U. S. A.
Died October 5, 1918.

First Lieut. William C. Reese, M. C., U. S. A.
Died October 20, 1918.

First Lieut. Ralph T. Saunders, M. C., U. S. A.
Died October 12, 1918.

First Lieut. Clyde E. Shedd, M. C., U. S. A.
Died October 16, 1918.

Captain William G. Turner, M. C., U. S. A.
Died October 11, 1918.

Captain Charles H. Weintz, M. C., U. S. A.
Died October 14, 1918.

THE
MILITARY SURGEON

VOL. XLIV FEBRUARY, 1919 No. 2

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE PREPARATION OF MEDICAL OFFICERS OF THE COMBAT DIVISION IN FRANCE AT THE THEATRE OF OPERATIONS

BY COLONEL BAILEY K. ASHFORD

Medical Corps, United States Army; Commandant of Army Sanitary School

ADVANCED special training of medical officers of the Combat Division has been provided for by creation of the so-called Army Sanitary School. Its main work was, in fact, not devoted to sanitation but to field service, and it was never a school in the sense we have ever known in the United States Army, but a center for information on front line conditions. Instruction was furnished by means of demonstrations to student officers on the field of battle, thus giving them their first opportunity to visualize the coming problems and to place at hand all the experience of our allied friends of the French and British armies to answer the questions of and to proffer advice to an army in whose advent they had taken so keen and disinterested concern.

Regarding the name of this activity, on the part of our corps in France, it was a concession to what seemed to be necessity to call it a "school." General Pershing has always been keenly alive to the necessity of training and information, and there is no doubt that the excellence of our rapidly trained troops, in competition with the veteran soldiers of nations famous for ages in war, has been largely due to the thoroughness and intelligent enthusiasm of those who had charge of the so-called school and training system elaborated out of this thought at General Headquarters. In fact, General Pershing is said to have so expressed himself.

This school center was established at Langres, a beautiful old Roman town perched on a hill and surrounded by a green carpet of woods and fields, the birthplace of the Marne, dotted with the

picturesque hamlets of France. While in the zone of operations and within easy touch of the immediate front from Alsace to Rheims, it was sufficiently quiet to allow individual attention to be directed to training and instruction. Here were grouped practically all of the schools of the Army, the only notable exception being that of the artillery, which was in the south. Headed by the Army Staff College, there followed the Candidates' School, the School of the Line, the Army Sanitary School, the Specialists' School (automatic weapons, etc.), the Engineers' School, Trench Mortar School, Tank Corps, and many others, with a total student population of about 20,000.

If there was one distinguishing feature of the Army in France, it was its sense of proportion and the intelligent coöperation of its units. Men had sunk all their private ambitions and their prejudices in the great game of winning the war, and it became evident that to "make good" it would be necessary to requisition all of the sciences and arts for the purpose of beating the boche, for the simple reason that war today is the art of applying scientific information and methods to conquer an enemy. Any art or science which failed to present a visible, concrete adaptation to the conditions of war deserved to be pushed aside by those which could contribute to the winning of battles. Thus the medical sciences are applied to war, the arts are applied in perfecting camouflage, in reviving the spirits of our soldiers by entertainment, etc. Even the manifold public utilities believed to be merely refinements of ease and comfort in times of peace, such as street cleaning, water purification, modern plumbing, had to be applied to winning the war.

This spirit of making practical contributions to our Army of that which we had practised as an art or a science in times of peace was the guiding principle that made coöperation such a real thing; it swept aside all meanness and prejudice which might have existed between rival representatives of these specialties of peace and those of the so-called lay-public who affect to deprecate the value of science because they do not practise it. The enthusiasm of all men with special knowledge was fired by a realization that the war needed them, and that by practical application of their knowledge they were powerful aides in the winning of battles. Into this high competition plunged the medical sciences. Heretofore, our doctors of medicine and surgery in civil life have largely, and quite naturally, thought in terms of the individual sick or wounded man—the highest and most altruistic point of view. It was the individual seeking

our professional advice in whose salvation we were most interested. This is the spirit which has proceeded from our medical schools, and even an exaggeration of this idea is seen in the numerous specialties which have absorbed practically all the attention of those practising them. The Army, largely sympathetic to the value of the humanist, had realized that however much one might practise the humanities these could form no specific part of the military program except as they influenced morale, unless men were salvaged for the line within a reasonable time. With this idea of adding to the duties of a medical man in war, that of rapidly returning to the fighting line men who had been temporarily put out by disease or injury, the medical sciences assumed tremendous importance from a military standpoint. But it is always the military application of the medical sciences that secures this happy result; that is to say, it is the personal equation of the man who sets this force at work. The Medical Corps discovered that it was the Salvage Corps for men, and that only by military medical officers could men be salvaged. A concrete example of this was forcibly presented by the famous Lemaitre, the father of the primary suture, who in a conversation to me made the following observation: "In the first six months of 1915, when we did not well understand the scientific principles underlying the treatment of war wounds, I personally cared for about twelve hundred wounded. Only about two hundred of these ever returned to the firing line. In the last five months, I have personally operated upon about eleven hundred men, and feel convinced that not over two hundred will fail to be returned to that line. In fact, the majority of them have gone back already." The convalescent camps of the British are said to return about one thousand of the men to the front every month. Therefore, the Medical Corps has become a military necessity of the first rank, an important source of reinforcement to the fighting troops. Add to this the prevention of disease by sanitation and by the efforts of the laboratory, and you have a correct idea of the force of the medical sciences in winning battles in the great war.

These rather lengthy remarks were necessary to place before you what I believe to be the spirit of our Corps. Let us now turn to the aims and accomplishments of our school established at Langres. This school, as were all of the schools, was under supervision of a general officer of the line (at first General McAndrews and then General Smith), who was in turn under the training section of the General Staff. The students were selected from incoming divisions,

an average of ten of the most wide-awake men being selected irrespective of rank, but with due regard to the importance of the field duties entrusted to them. Some divisions insisted on more than ten and from some only four or five could be spared. The teaching force consisted of a commandant, an assistant commandant and several instructors, with a small office force, a field hospital and an ambulance company. Later on it was decided that the school should lodge its student officers and provide messing facilities within the building. After considerable difficulty there was secured from the French a large young girls' college, about two-thirds of which was dedicated to the school. At the same time, in view of the activity of our line, it was decided to turn over both our ambulance company and field hospital for active service and substitute therefor the necessary transportation with its personnel and a force of men sufficiently large to man the building. From the first an arrangement was made between the commandant and the director of professional services, as well as with the individual members of the Consulting Staff of the American Expeditionary Forces, whereby selected members of that staff (the most noted men in medicine, surgery and hygiene in the United States and our national leaders in civil life) should represent their specialties in a course of short lectures and demonstrations. To the concurrence of these men as well as to that of distinguished foreign medical officers, principally French and British, the school owed much of its success. These lecturers comprise the following well-known names:

Brigadier General Finney, M. C., in general charge of surgery, A. E. F.; Brig. Gen. William S. Thayer, M. C., in general charge of war medicine, A. E. F.; Professor Chutro, of the Lycée-Buffon, Paris; Professor Tuffier, Chief Consultant Surgery, French Army; Maj. Jos. A. Blake, M. C., one of the few American surgeons who had seen the war from its inception as an operating surgeon; Col. W. L. Keller, in command of a French hospital near Paris for the treatment of fractures; Maj. Gen. Cuthbert Wallace, Consulting Surgeon, British Army; Capt. E. M. Cowell, R. A. M. C., authority on shock; Maj. Gen. H. N. Thompson, Chief Surgeon, First British Army, to whose interest and coöperation through his own school for medical officers much of our success is due; Maj. Gen. C. H. Burtchaell, at first Chief Surgeon of the lines of communication and afterwards Surgeon General of the British Army in France; Maj. J. W. McNee, British Army, authority on trench fever; Captain Parkinson, R. A. M. C., epidemiologist; Capt. R. Jacobs, R. A. M. C., sanitary engineer

and the devisor of many of the well-known improvised British sanitary appliances; Colonel Ross, Canadian Corps, Division Surgeon, Battle of Passchendaele; Sir Almroth Wright, noted bacteriologist; Captain Lemaitre, French Army, from whose work to a large extent the modern operative technique of war wounds proceeded; Major Leriche, of the Faculty of Lyons, specialist in articular surgery; Captain Roux-Berger, French Army, specialist in wounds of the chest; Major Lecene, Consulting Surgeon for French Army, a talented French surgeon; Major Policard, Chief of Laboratory group for French Army, whose modern conception of histo-pathology contributed to the scientific treatment since evolved; Major Tissier, of the Pasteur Institute, who contributed one of the most valuable studies on the bacteriology of war wounds; Major Piollet, French Army, formerly assistant to Dr. Carrel; Major Okinczyc, Faculty of Medicine of Paris, Consulting Surgeon of an army corps and well-known laparotomist; Lieutenant Colonel Raymond, French Army, Associate Professor of Val-de-Grâce, authority on trench foot; Major Guillain, French Army, Associate Professor, Faculty of Medicine of Paris, authority on neurology; Professor Charles Richet, Member of the Academy of France, originator of the theory of anaphylaxis; Major Nogier, eminent physicist, Associate Professor of Medicine of Lyons, French Army; Major Collin, French Army, M. C., expert on questions of front-line operations of medical service and evacuation; Lieutenant Colonel Thoris, Division Surgeon, singularly well informed on the military administration of medical units in the field; Major Paul, medico-legal center for the French Army, authority on gases; Major Aime, French Army, operating surgeon, French hospital; Colonel Stark, M. C., Chief Surgeon, First American Army; Maj. Gen. Sir Wilmot Herringham, British Army, authority on trench nephritis and trench fever; Lieutenant Colonel Fawcett, British Army, Director, British school for medical officers; Captain Douglas, British Army, expert on gas poisoning; Colonel Soltau, British Army, authority on chest wounds; Capt. J. Davidson, British Army, well-known entomologist; Major McCormick, British Army, well-known authority on skin diseases; Major Jeanbrau, French Army, authority on blood transfusion; Professor Babinski, well-known authority on diseases of the nervous system and war injuries of the nerves (both he and his associate, Professor Goderich, demonstrated a large number of diseases and injuries affecting the peripheral nerves in war); Professor Morestin, well-known authority on plastic surgery of the face; Lieutenant Colonel Salmon, Senior

Consultant Psychiatry, whose work has placed this branch of medicine on a practical basis in the American Army; Col. Joseph Siler, chief of a laboratory center of the American Army, whose services have reached into all parts of the Army; Col. Paul Stanley Brown, well-known authority on military tactics and Commandant of the Engineers' School; Maj. Alexander Lambert, head of the American Red Cross in France; Lieut. Col. George Brewer, Consultant Corps Surgeon, A. E. F.; Lieutenant Colonel Simmons, Consultant Corps Surgeon, A. E. F.; Major Poole, Chief of Surgical Clinic, Evacuation Hospital No. 1.; Maj. Joel E. Goldthwait, Senior Consultant, Orthopedic Surgery, who, with Colonel Baer and Colonel Allison, took orthopedics not only into the field hospitals and battalion aid posts but carried it into "No Man's Land"; Maj. T. R. Boggs, internist; Maj. Richard Strong, demonstrator of the vector of trench fever; Captain McGruer, specialist, skin diseases; Col. Harvey Cushing, whose original work on brain surgery at the British and American fronts is giving such a remarkable reduction in mortality; Maj. H. F. Swift, internist, clinical expert on trench fever; Captain Hussey, in charge of the instruction of Resuscitation Teams and specialist on blood transfusion; Colonel Zinsser, epidemiologist; Lieut. Col. George W. Crile, whose work on shock in this war has contributed to the saving of so many lives; Col. Walter Cannon, M. C., who has contributed much to the scientific solution of problems concerning battlefield shock; Col. Hugh Young, M. C., Senior Consultant, genito-urinary surgery and skin diseases, whose work did much towards making the prevention of venereal disease possible in the American Army; Professor Major Regaud, Director of French school of instruction for medical officers, physicist, Pasteur Institute; Captain Magrou, French Army, bacteriologist, Pasteur Institute; Major General Ruotte, Chief Surgeon of the Fourth French Army; Major General Laznet, Chief Surgeon of the Sixth French Army; Lieutenant Colonel Norris, M. C., expert in the treatment of gas cases; Captain Baetjer, bacteriologist; Lieutenant Colonel McKernon, Senior Consultant, ear, nose and throat, American Army; Lieutenant Colonel Greenwood, Senior Consultant, diseases and injuries of the eye, American Army; Major Brabson, General Staff, American Army; Colonel Grissinger, Chief Surgeon, First Corps, First Army; Col. Charles Reynolds, Chief Surgeon, Second American Army; Maj. Gen. Sir Bertrand Dawson, authority on spirochetal jaundice, British Army; Lieut. Col. Gordon Holmes, authority on psychiatry, British Army; Lieutenant Colonel Hume, authority on

disordered action of the heart, in charge of a convalescent camp, British Army; Lieutenant Colonel Fullerton, authority on wounds of the bladder, British Army; Lieutenant Colonel Keyes, authority on venereal disease, United States Army.

I have purposely given this list of names with my own comments, not that these men need any words of praise, as their work commends them to every medical man throughout the world, but to show what they were specially doing in this war and what powerful resources the school was able to count upon to build up a healthy doctrine for the unification of our American medical service. The school acted as a veritable clearing house for the exchange of ideas and for all of those bits of information without which a medical officer in this great war would have been absolutely and totally at a loss to substitute from earlier knowledge or previous experience. I have undoubtedly omitted some names. It can readily be seen that to have embraced them all would presuppose longer time and more thoroughness than an article of this kind could hope to command. I have also refrained from mentioning the particular part taken by the instructors of the school proper, because of my genuine appreciation of the men with whom I was associated so closely. It will be impossible for me to do sufficient justice to their excellent contribution and to their unsurpassed devotion to the school without seeming to be fulsome. These instructors were Col. Ralph C. Porter, Assistant Commandant and afterwards Division Surgeon, Twenty-sixth Division; Lieut. Col. R. C. McDonald, M. C., instructor in the tactical use of medical department units; Lieut. Allen C. Sutton, graduate of the Army Staff College at Langres and Assistant to Colonel McDonald; Major Burnett, M. C., instructor in military hygiene and other subjects relating to front-line work; Major Boothby, pioneer worker in the American Army in matters concerning gas defense; Captain Taylor, M. C., internist and lecturer on front-line work, formerly Regimental Surgeon, First Engineers, First Division, and others.

Up to the date of my leaving the school in October, 1918, eight sessions of approximately six weeks each were held, attended by a total of about 500 medical student officers. The first half of each session was devoted to lectures and demonstrations at Langres, the second half was consumed in a tour of the front, in which all of the students took part. This gave about three weeks on practically all of the western front from the North Sea to Alsace. The first four sessions devoted this time to the British and French fronts, as our

own had not then been established. We were handsomely received on all of these occasions at the British and French schools for medical officers. Transportation was supplied us to visit all parts of their lines from battalion aid post and front-line trenches clear back to general hospitals. Their coöperation was of vital importance. Practically every medical unit that is named in literature or that was used during this war was seen by us during its functioning; in many instances we had an opportunity to take part in the actions. Much of this work was of course under fire, and entailed the vicissitudes of trench and open warfare. On one occasion at the British front a bomb fell, near where we were waiting for dinner, into a company of English soldiers. The service of our surgeons was solicited by the British medical officers and the thanks of their chief surgeon were later conveyed officially to our own. When the American front was established the same study tours were made, but in addition the school contributed during periods of operations from among its members to man operating teams and even furnished front-line medical officers. On several occasions the student officers were hastily sent for to take battle positions, notably in the St. Mihiel battle and the last fight around Verdun and in the Forest of Argonne.

Thus our school informed the medical officers sent to it of the special conditions of *this* war, then carried out to the battlefield to visualize all that had been told them. No attempt was made, beyond morning calisthenics, staff rides and walks, and inspection of actual records, to go into details of drill, paper and property work, not because it was not valuable but because we believed that this basic training should already have been in their possession and that time did not permit to train them now.

This unique school, perhaps the most unique in the history of medicine in our country, should be kept up in some form in times of peace. Military matters connected with the Medical Department, though of vital importance and abundantly provided for at our school by problems, map reading, field sketching, etc., should not, however, displace the equally important questions affecting the application of our professional skill and knowledge to the conditions of war.

Thus the Army Sanitary School of Langres in its short life of one year leaves behind it a history full of interest. It was in reality the Staff School of the Medical Corps and bore the same relation to it that the Staff College did to the line. Elementary drill and train-

ing were not attempted and only the broader practical questions connected with this war were taken up. It was never intended to put huge numbers of medical officers through this school. We preferred to select specially qualified men from each division at the time they most needed instruction, at the threshold of the war for them, in order that on their return to their divisions they might be the instruments by which some unity of action in military and professional matters connected with the Medical Department could be attained and this work put eminently in practice. In addition, the school determined from the very first to take close notes on all information imparted to us by the lecturers (some of whose names have been recited), and upon all operations of the medical services noted in the visits to the fronts. These notes, with our estimate of the special qualifications of the student officer, and a thesis selected by him on a subject connected with the medical service in time of war, formed the bases upon which the Commandant of the School and the faculty noted upon an efficiency record the special fitness of this officer for the various functions required of our Corps, *e. g.,* regimental work at the front, director of field hospital, director of ambulance company, operating teams of the evacuation hospital, medical supplies, and specialties, as required in the course of the six weeks' training. The object of this was not to presume to state a man's relative value, but to classify him rapidly for the great emergency of providing the proper man for the proper place in this war.

At the conclusion of each session of the school, the note-books of all of the student officers were gone over, together with the note-books of the instructors themselves, and a composite of all that had been heard and seen was made, written in concrete form and mimeographed. In many instances the lecture was reported in full by our stenographer and published. This was especially true of the system devised by the school of inviting all persons who had been in a position to see the most and carry the most responsibility in definite operations to take part in a symposium of this or that battle. These symposia lasted an afternoon or an evening, and were intensely interesting and of great historic value because some of them took place within the sound of the guns of the enemy at the close of the engagement under discussion. I shall never forget the intense interest elicited in one of these symposia held for us by Lieutenant Colonel Seaman of the 32d Division behind some ruined walls in the open battlefield, still littered with bodies of men and animals at the famous Reddy farm, headquarters of the German Crown Prince. In

another instance, the officers of the 26th Division reported their participation in the engagement which became the Second Battle of the Marne, only a few days after that battle was fought. These symposia had the double quality of serving as a means of relaxation for the officers who took part in them as well as exercising a stimulating effect upon us all of the school. They contributed historical points of priceless value before the vivid pictures had begun to fade from the memories of the men who took part in the engagements and before these memories were confused by outside comment. In other words, they were liable to be more correct statements of facts than we could get now. All this literature was mimeographed and distributed throughout the entire American Expeditionary Forces, chiefly to medical officers. In its totality it comprises something over one thousand pages, but every phase of the medical service in this war was treated, the information was concrete, and the instructions were simple and direct. It was an attempt to make available for the entire force of medical officers the essential truths which were coming out under the stress of war and during the progress of that war, rather than to wait until after it was all over, when men's attentions were directed to other things and when these saving truths could not be applied to war. It is contended and urged that the policies adopted should form an integral part of our Medical Department in so far as it is possible to apply them under conditions of peace in preparation for possible war.

While it is not possible even to mention the many important subjects treated by lecture or demonstration, just to give an idea of the scope of instruction, a few notes will be made concerning such subjects.

1. *Administration.*—This was *not* paper work or property responsibility; it was the art and science of handling medical units on the field in a systematic manner. It included a knowledge of the plan of operation of every branch of the service; a knowledge of map-reading, field-sketching and map and terrain exercises; the methods of the evacuation of wounded; the general administration of large hospitals, hospital trains, boats and all units in the lines of communication, etc. The great importance of paper work and property responsibility was not slurred, nor is it slurred in this article. Its value is appreciated, but it is sustained that in a school of this sort time should not be taken save for the most important phases thereof. Such of these phases as possible were taught, but by visits to big medical supply depots, inspection of records and means of

locating evacuation hospitals, base hospitals, etc., some of the most poignant lessons and demonstrations were learned in the zone between battalion aid stations and evacuation hospitals, where were seen in operation during hostilities the problems connected therewith and their solutions. In Paris, clinics and clinical talks were given by Professor Tuffier, Professor Babinski, Professor Jeanbrau, Major Blake, Professor Chutro, and others. The Val-de-Grâce Museum was visited, as was the St. Nicholas Hospital for treatment of burns, where ambrine was being used. At Boulogne lectures and demonstrations were given on convalescent camps, disordered action of the heart, war neuroses, spirochetal jaundice, sanitation, fractures, etc. In the course of these lectures and demonstrations we were able to convince all of our students of the necessity for the removal of as much devitalized tissue as is compatible with the subsequent functioning of the part, surveillance of the wound for three or four days or a week under bacteriological check, and its suture. By means of our own magnificent clinics at La Fauche, under Colonel Salmon and his assistants, we were able to get a correct point of view of war neuroses and their treatment. We were able to settle upon a definite plan for the avoidance of trench foot. We urged upon all of our students that skin diseases were one of the chief, if not the chief, contributory factors to incapacitation for service by illness, and that this factor could be reduced to a negligible quantity by proper bathing and delousing facilities, all of which were demonstrated. We were able to demonstrate the real and proper employment for the evacuation by ambulance companies and the sphere of the field hospital. The functioning of the evacuation hospital conceived as the advance post of operative surgery was taught as well as the handling of wounded at hospitals to its rear. There was not a member of our class who did not know how to put on, "by the numbers," the Thomas splint, and this was taught to his men on his return so that they could do it mechanically. The problem of wound shock was systematized and all of our officers were convinced that shock could be prevented if the patient was properly handled. No officer of our school left for the front without being an expert in gas defense. Great attention was paid to the demonstration of water analysis in the field and the improvisation of sanitary appliances, especially the more general use of the incinerator. Also specific attention was paid to inspections of kitchens and their economical and cleanly administration. Of all the things that the school was able to teach, there is nothing that gives the writer more

satisfaction than to be able to say that all of our officers were impressed with the necessity that our wounded men should be treated with gentleness and care and surrounded with comforts which had become by experience in the armies of our Allies real military necessities.

The school tried to give a comprehensive idea of all that pertains to the Medical Department and how it might be applied in an intelligent manner for the practical functioning of every part in consonance with the activities of the whole Army. This is *administration*, and officers who know all of these things are the best administrators.

THE EPIDEMIOLOGY OF THE SPUTUM-BORNE DISEASES AND ITS RELATION TO THE HEALTH OF THE NATIONAL FORCES

THE WELLCOME FIRST PRIZE ESSAY, 1918

BY COLONEL EDWARD B. VEDDER

Medical Corps, United States Army

ONE hundred years ago, the deficiency diseases were among the most important diseases of the soldier and whole armies were incapacitated by scurvy. As an illustration it may be mentioned that the French army in the Crimea, averaging 86,740 men, reported 23,250 cases of scurvy, this only including those cases that required hospital treatment. In the Civil War, scurvy was always present, occasionally assuming epidemic proportions, and 30,714 cases were reported among the white troops during the period of the war, or a rate of 71.2 per thousand. The rate was higher among the colored troops.

Such diseases are a thing of the past, and it is not too much to hope that we will never hear of the appearance of scurvy in the American Army in the present war. It may not be out of place, however, to point out that it appeared among the British troops in Mesopotamia, and that the recent tendency to reintroduce desiccated vegetables may, if carried to an extreme, lead to the production of scurvy. An exclusive diet of desiccated vegetables will produce scurvy in men and guinea-pigs and the desiccated vegetables used during the Civil War were without effect in the prevention of scurvy, which was only stopped by the issue of fresh vegetables and fruits.

A few years ago the intestinal diseases were the greatest cause of illness in our armies. Now to all intents and purposes typhoid fever has been eradicated from the Army by means of compulsory vaccination, and is no longer a military problem. There are also indications that the incidence of other intestinal diseases such as bacillary dysentery and cholera may also be reduced by protective vaccines. It is possible, therefore, that the days when intestinal diseases were the scourge of armies are past.

As the result of this and other progress that has been made in military medicine and sanitation, one is tempted to say that, for practical purposes in this war, military medicine consists of only three chapters, as follows: Chapter I, The Sputum-Borne Diseases;

Chapter II, The Venereal Diseases; Chapter III, The Insect-Borne Diseases.

Of course such a sweeping statement is not strictly true; broad generalizations seldom are. But it serves to focus our attention upon essentials. In discussing the validity of the suggested classification, it may be pointed out that the importance of insect-borne diseases has been fully recognized in late years, and we may note that trench fever transmitted by the louse, and scabies transmitted by the itch mite (entomologists please note that the writer is aware that the *Sarcoptes scabiei* is an acarine and not an insect), are two of the diseases causing much of the non-effectiveness on the western front at present.

The importance of the venereal diseases has also been emphasized in recent years. Indeed they have been considered to be the diseases that are most wide spread, and cause the highest non-effective rate of all diseases. Far be it from the writer to seek to detract from the serious consideration which must be given to this class of diseases. Gonorrhea probably affects a greater number of men than any other one disease if we except the common cold, and the disabling effects of both gonorrhea and syphilis are well known. But when all is said and done, there are only three venereal diseases; namely, syphilis, gonorrhea and chancroid; and a consideration of actual statistics will show that the larger group of diseases, which may for convenience be denominated as sputum-borne, overshadows in importance even the venereal diseases.

What are the sputum-borne diseases? We may say that they include tuberculosis, pneumonia, influenza, tonsillitis, bronchitis, measles, mumps, scarlet fever, whooping cough, diphtheria, cerebrospinal meningitis, and the sequelae of these diseases. Let us glance at the following tables and see how the sputum-borne diseases compare with the venereal diseases in importance. Table I is compiled from the annual report of the Surgeon General for 1916, giving the figures for the year 1915, which may be taken as a sample year before we entered the war.

Table II gives the figures for the same diseases for the year 1917. I am indebted to Lieut. Col. Albert G. Love, of the statistical division of the Surgeon General's Office, for these figures. The Regular Army, the National Guard and the National Army are considered separately.

It is not claimed that these tables present all the incidence of either the sputum-borne diseases or the venereal diseases. It will

TABLE I.—*Admissions, Deaths, Discharges and Noneffective Rate of all Enlisted Men in U. S.*

Mean strength.....63,725

	Admissions		Deaths		Discharges		Noneffective rate	
	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio
Tuberculosis of lungs	157	2.46	23	0.20	160	1.59	144.34	2.27
Miliary tuberculosis	1	0.02	3	0.02	0	0	0.27	0.01
Tuberculosis, other forms	13	0.21	4	0.07	10	0.09	4.02	0.07
Pneumonia, lobar	175	2.75	27	0.42	0	0	12.84	0.20
Pneumonia, broncho	44	0.69	5	0.08	1	0.02	3.37	0.05
Influenza	2,680	42.05	4	0.06	1	0.02	34.10	0.54
Diseases of pharynx (mostly tonsillitis)	4,613	72.38	1	0.02	0	0	64.05	1.01
Bronchitis	2,353	36.92	1	0.02	5	0.03	39.70	0.62
Measles	555	8.71	20	0.31	8	0.12	34.32	0.54
Mumps	511	8.02	0	0	0	0	22.85	0.36
Scarlet fever	47	0.74	1	0 02	0	0	4.51	0.07
Whooping cough	0	0	0	0	0	0	0	0
Diphtheria	56	0.88	0	0	0	0	2.47	0.04
Cerebrospinal meningitis	23	0.36	9	0.14	7	0.09	3.18	0.05
Total sputum diseases	11,228	176.19	98	1.36	192	1.96	370.02	5.83
Syphilis	1,099	17.24	3	0.05	46	0.54	78.05	1.22
Chancroid	1,007	15.80	0	0	2	0.03	45.78	0.72
Gonorrhea	3,222	50.56	1	0.02	29	0.31	130.59	2.05
Total venereal diseases	5,328	83.60	4	0.07	77	0.88	254.42	3.99
Total all diseases	35,972	564.49	193	2.99	1,199	11.93	1,329.77	20.87

TABLE II.—*U. S. Enlisted Men. Admissions, Discharges, Deaths, with Ratios, for Regular, National Guard and National Army, 1917, in United States.*

	Admissions						Deaths					
	Regular Army		National Army		National Guard		Regular Army		National Army		National Guard	
	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio
Tuberculosis of lungs	2,018	10.13	1,813	10.93	2,968	15.34	37	0.19	22	0.13	29	0.15
Miliary tuberculosis, acute	9	0.05	11	0.07	16	0.08	1	0	1	0.01	5	0.03
Tuberculosis (other forms)	148	0.74	140	0.84	151	0.78	7	0.04	4	0.02	8	0.04
Pneumonia, lobar	1,842	9.24	1,961	11.82	3,161	16.34	200	1.00	210	1.27	337	1.74
Pneumonia, broncho	373	1.87	331	1.99	764	3.95	56	0.28	39	0.23	107	0.55
Influenza	11,147	55.94	8,742	52.69	12,359	63.87	2	0.01	2	0.01	3	0 02
Disease of tonsils	19,747	99.10	8,448	50.92	14,826	76.62	12	0.06	1	0.01	5	0.03
Bronchitis	15,432	77.45	10,483	63.18	15,318	79.17	1	0	1	0.01	2	0.01
Measles*	11,382	57.12	14,853	89.52	21,338	110.28	234	1.17	248	1.49	465	2.40
Mumps	6,846	34.36	4,595	27.69	10,284	53.15	2	0.01	3	0.02	3	0.02
Scarlet fever	1,045	5.24	427	2.57	494	2.55	27	0.14	18	0.11	3	0.02
Whooping cough	11	0.06	6	0.04	8	0.04	....	....	....	....	....	....
Diphtheria and results (including laryngitis diphtheritic, neuritis diphtheritic, paralysis diphtheritic)	665	3.34	124	0.75	374	1.93	6	0.03	3	0.02	3	0.02
Cerebrospinal meningitis	236	1.18	385	2.32	350	1.81	83	0.42	111	0.67	108	0.56
Total sputum-borne diseases	70,901	355.82	52,319	315.33	82,411	425.91	668	3.35	663	4.00	1,078	5.59
Syphilis	3,318	16.65	2,182	13.15	2,974	15.37	13	0.07	4	0.02	3	0.02
Chancroid	3,581	17.97	1,144	6.90	2,727	14.09	1	0	....	....	....	....
Gonococcus infection	17,067	85.65	12,360	74.50	18,233	94.23	....	....	2	0.01	1	0
Total venereal diseases	23,966	120.27	15,686	94.55	23,934	123.69	14	0.07	6	0.03	4	0.02
Total all diseases	188,029	943.62	118,062	711.58	189,340	978.55	933	4.68	760	4.58	1,291	6.67

Mean strength Regular Army, 199,263. Mean strength National Army, 165,916. Mean strength National Guard, 193,489.
* Includes measles complicated with broncho and lobar pneumonia and other complications.

TABLE II.—*U. S. Enlisted Men. Admissions, Discharges, Deaths, with Ratios, for Regular, National Guard and National Army, 1917, in United States*—Continued.

	Discharges						Noneffective rate					
	Regular Army		National Army		National Guard		Regular Army		National Army		National Guard	
	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio	Number	Ratio
Tuberculosis of lungs	1,190	5.97	454	2.74	1,862	9.62	....	1.19	....	0.45	....	0.62
Miliary tuberculosis, acute	1	0	1	0.01	5	0.03	....	0	....	0	....	0.01
Tuberculosis (other forms)	67	0.34	34	0.20	62	0.32	....	0.07	....	0.04	....	0.04
Pneumonia, lobar	13	0.07	4	0.02	9	0.05	....	0.64	....	0.55	....	0.99
Pneumonia, broncho	3	0.02	.....	....	1	0	....	0.10	....	0.07	....	0.18
Influenza	3	0.02	.....	....	.....	....	....	0.71	....	0.49	....	0.73
Disease of tonsils	6	0.03	5	0.03	4	0.02	....	1.42	....	0.63	....	1.07
Bronchitis	18	0.09	6	0.04	30	0.15	....	1.22	....	0.85	....	1.26
Measles*	10	0.05	3	0.02	7	0.04	....	1.92	....	2.62	....	3.37
Mumps	.....	....	.....	....	.....	....	....	1.22	....	0.83	....	1.64
Scarlet fever	3	0.02	.....	....	.....	....	....	0.37	....	0.14	....	0.15
Whooping cough	.....	....	.....	....	3	0.02	....	0	....	0	....	0
Diphtheria and results (including laryngitis diphtheritic, neuritis diphtheritic, paralysis diphtheritic)	.....	....	.....	....	.....	....	....	0.16	....	0.03	....	0.10
Cerebrospinal meningitis	14	0.07	.....	....	.....	....	....	0.10	....	0.13	....	0.10
Total sputum-borne diseases	1,328	6.68	507	3.07	1,983	10.25	....	9.12	....	6.83	....	10.26
Syphilis	166	0.83	98	0.59	135	0.70	....	1.06	....	0.62	....	0.87
Chancroid	4	0.02	3	0.02	6	0.03	....	0.79	....	0.25	....	0.58
Gonococcus infection	120	0.60	37	0.22	171	0.88	....	2.36	....	1.32	....	2.87
Total venereal diseases	290	1.45	138	0.83	312	1.61	....	4.21	....	2.19	....	4.32
Total all diseases	5,379	26.99	2,703	16.29	7,800	40.31	....	25.61	....	15.19	....	24.72

Mean strength Regular Army, 199,263. Mean strength National Army, 165,916. Mean strength National Guard, 193,489.
* Includes measles complicated with broncho and lobar pneumonia and other complications.

at once occur to the critic that the incidence of venereal diseases is much higher than is indicated by the sick report; that syphilis frequently masquerades under other diagnoses; and that finally the incidence and disability caused by locomotor ataxia and paresis are not included under the totals for venereal disease. But, on the other hand, it may be pointed out that pleurisy, commonly a sequel of tuberculosis or pneumonia, and acute articular rheumatism, often a sequel of tonsillar infections, are not included in the list of sputum-borne diseases. Coryza, a condition probably more frequent than any other malady, seldom appears on the sick report and is not included in these tables except as complicated with bronchitis. Only the more severe cases of bronchitis and tonsillitis appear, so that these conditions are likewise far more prevalent than are indicated by the sick report.

For these reasons it is believed that these tables present a fair comparison of the relative importance of the sputum-borne diseases and the venereal diseases. From them we may conclude:

1. In both tables, influenza, bronchitis and tonsillitis are responsible for the highest rates, both admission and non-effective.

2. Before the war, measles was a relatively unimportant factor. In 1917 it caused more admissions than any other disease except gonorrhea, bronchitis and tonsillitis.

3. That scarlet fever and diphtheria are relatively unimportant causes of admission in both years.

4. Cerebrospinal meningitis is of still less importance so far as admissions and non-effective rates are concerned. If it were not for the high death rate of this disease and the terror that it inspires, it would cause little or no concern to the military sanitarian.

5. Whooping cough is practically non-existent.

6. That the admission, death rate, rate of discharge and non-effective rate are all higher for the sputum-borne diseases than are the corresponding rates for the venereal diseases. Averaging both years the admission rate for the sputum-borne diseases was approximately two and one-half times higher than the admission rate for venereal diseases. The deaths from the sputum-borne diseases are approximately forty-five times more numerous than the deaths from venereal diseases. (In this connection it should be noted that while the mortality from the venereal diseases, particularly syphilis, is very high, it does not commence until after the fortieth year, and therefore makes very little impression on the sick report of armies, where the men are all young.)

7. It may also be noted that although the admission rates for influenza, tonsillitis and bronchitis were all lower in the National Army than the corresponding rates for the Regular Army, this relationship is reversed in the case of measles. The rate for measles in the National Army was 89.52 as compared with 57.12 in the Regular Army. Obviously, in the case of measles, there must have been some factor which rendered the National Army far more susceptible to that disease, and it could not have been any factor concerned with the distribution of infectious sputum, because the National Army was less afflicted with other sputum-borne diseases.

A study of the distribution of measles by camps has thrown a light on this factor. It is a noteworthy fact that the National Army and National Guard camps in the south and west have almost invariably suffered from a higher incidence of measles than the Regular Army camps or the National Army camps in the north. It appears therefore that recruits from the south and west are more susceptible to measles than recruits from the north. What is the cause of this higher susceptibility in certain localities? In the south it would be easy to ascribe it to our old *bête noire*, the hookworm. Siler and Cole (1) conclude that "An analysis of the available data showed that men with hookworm disease actually came down with measles with twice the frequency of men free from the disease, irrespective of whether they lived in urban or rural districts." On the other hand, Munson (2), in a study of the same two regiments, found that both regiments were the same size, both heavily infected with hookworm, but that the sanitary discipline of one regiment was bad, resulting in a rate of 204 as compared with 133 for the regiment with better discipline. It is quite possible that hookworm, bad discipline and other factors have had a certain amount of influence on the incidence of measles, but it seems clear to the writer that these are not the real causes for the great increase in the rates for measles in the southern and western camps. The real cause is believed to lie in the fact that there is more susceptible material in the south and west. In the north, where communities are more thickly settled and where more attention is paid to school attendance of children, measles is a children's disease, not a disease of young manhood. Our northern troops had very generally already had measles and were immune. The southern and western troops contained a smaller proportion of immune individuals, and with more fuel the conflagation assumed greater proportions.

Having thus shown the relationship of the various sputum-borne diseases to the health of our national forces, we may proceed to a

more detailed consideration of the epidemiology, and especially of the mode of transfer of the different sputum diseases.

Tuberculosis.—It is generally accepted that the most usual method of infection is by inhalation or ingestion of the dried and pulverized sputum from careless consumptives. The *B. tuberculosis* withstands drying for long periods. It has been definitely shown that infection from bovine sources is possible but rare. Park and Krumwiede (3) determined the origin of the organism in 1,042 cases of human tuberculosis, of which only 101 were of bovine origin, and over half of these bovine strains occurred in children under five years of age. But it must not be supposed that the cases of tuberculosis appearing in the military service have contracted their infection recently. Naegeli's statistics indicate that nearly all adults have been infected with tuberculosis, but that the lesions are either healed or quiescent. These figures, which are based on a large series of necropsies, show that, from the first to the fifth year of life, tuberculosis is rare and usually fatal. From the fifth to the fourteenth year one-third of his cases had tuberculous lesions. From the fourteenth to the eighteenth year one-half the cases showed tuberculosis. Between eighteen and thirty, nearly all the cases examined showed some trace of tuberculous infection. After the age of thirty, the active lesions gradually diminished in number and the healed lesions increased.

We may assume, therefore, that the great majority of our recruits have been infected with tuberculosis, but only a small fraction suffer from the disease. Bushnell (4) states that, as the result of the special examinations that have been carried out in the service during the past year, somewhat less than one per cent of actual cases of tuberculosis have been detected. From these facts it seems clear that we cannot expect to reduce the incidence of tuberculosis materially by the adoption of methods for the prevention of sputum-borne diseases in our camps, since the infection was not contracted there. But the measures should nevertheless be taken for obvious reasons. More important in dealing with tuberculosis is the early separation of these cases from the command, both for their own sakes and as a potential source of infection. Bushnell pointed out that each tuberculosis patient returning from Europe will cost the Government $5,000; while the patient who never leaves this country will only cost 1,000, including pension. The early segregation of these patients will thus save the Government millions of dollars. Naturally, still more would be saved if these cases could be excluded on their preliminary ex-

amination so that they would never be taken into the service; but we may assume that there is little prospect that this examination will become more efficient. Instead it will probably become less efficient as the need for men increases.

Lobar Pneumonia.—While not approaching the rates for influenza, tonsillitis, bronchitis and measles, the admission rate for lobar pneumonia is only slightly less than that for tuberculosis, and the death rate for lobar pneumonia is higher than that of any other disease except measles, truly the "captain of the men of death."

The pneumococcus is the etiological factor in the great majority of cases of lobar pneumonia. It is interesting to note that this organism was first described by Sternberg and Pasteur in 1880 (the same year that the *B. typhosus* was discovered), although it was not until six years later that it was found that this organism was the cause of pneumonia. In spite of the fact that the causal organism was discovered thus early, little further progress in the epidemiology of pneumonia was made until very recently.

Largely as the result of the work of Dochez and Avery (5) we have found that there are several types of pneumococci, which, so far as this country is concerned, may be divided into four groups. These groups or types, with the relative number of cases in which each type is found, and the resultant mortality, are shown in the following table (6):

Type.	*Percentage of cases.*	*Mortality in per cent.*
I	33.3	25.0
II	33.5	32.0
III	13.0	25.0
IV	20.2	16.0

It should be noted that the third type is the organism usually known as the pneumococcus mucosus, while the fourth group is not a single type but a group of organisms, usually of low virulence, which have not fallen into the other three types.

It is known that pneumococci are often found in the mouths of normal individuals, but in a large proportion of cases, when the individual has not not been exposed to a case of pneumonia, these organisms belong to class 4, including the organisms of low virulence. Individuals exposed to a case of pneumonia may become true carriers of the virulent type found in that case for a variable, but usually short (12 to 90 days), period of time. Thus in 297 persons, pneumococci were found in 116 cases, as follows: Type I, 0.8 per cent; Type II, 18.2 per cent; Type III, 28.1 per cent; Type IV, 52.9 per cent.

It is evident, therefore, that lobar pneumonia is conveyed to the healthy through the sputum of convalescents and carriers. Although in many respects the pneumococcus is a rather delicate organism, it withstands drying very well, and has been found many times in the dust from the rooms of cases of pneumonia. It seems possible, therefore, that it may be transmitted to some extent by infected dust, although probably far more commonly through the direct transfer of infected sputum. Any conditions that lead to overcrowding or favor the transfer of sputum from one individual to another must lead to an increase in the number of cases of pneumonia. At the same time it should be recognized that other factors are probably concerned in the production of pneumonia, for many individuals who harbor the infective organism never suffer from pneumonia. It is probable that exposure to cold and wet predispose to the disease, though it must be borne in mind that epidemics have also occurred in the tropics as the result of overcrowding and conditions that favored a rapid transfer of the pneumococcus.

Since the prevention of this disease must depend largely upon measures taken to prevent this transfer of infectious sputum, and since the same measures will effect a similar reduction of all of the sputum-borne diseases, these measures will be discussed later.

The prevention of this disease is especially important, since the mortality is so high. Moreover, this mortality has not been greatly reduced under modern methods of treatment. The statement that the serum treatment of the disease, which has been introduced during the past few years, is disappointing, will probably give rise to hostile criticism. Yet there is no dodging the fact that the serum has been very generally used in the Army during the past year and that the death rate is still very high. The reason is not far to seek. The sera that have been developed are only claimed to be effective against the Type I organisms. The most that can be said for the polyvalent sera produced by some manufacturers is that they do no harm in the other types of pneumonia and that they are equally as effective as the specific serum against the Type I cases. Now, of every hundred cases of pneumonia, only 33 will belong to Type I. Only 25 per cent of these cases will die, so that out of every hundred cases of pneumonia there will be approximately eight deaths from the Type I cases, while the mortality from the other types will be approximately 19. Thus, if the serum saves every case of Type I pneumonia who would otherwise die, a result not claimed by even its warmest advocates, only eight out of a total of twenty-seven fatalities would be prevented. I am not arguing that it is not

worth while to attempt to save these eight cases. But I do claim, unless sera are developed that are effective against the pneumonias from other types, that the only way to prevent the excessive mortality from pneumonia is to reduce the incidence of the disease.[1] The emphasis is therefore placed on sanitary rather than on curative measures. Among these may be placed protective inoculation. It is quite possible to prepare a vaccine against Types I and II which earlier figures indicated caused by far the greatest number of cases; and it is understood that this vaccine will be ready to issue for volunteers this fall. It is to be hoped that medical officers will encourage the men to volunteer for this purpose, for, if a sufficient number are secured, information will be obtained in a short time as to the value of this measure.

Broncho-pneumonia.—This condition is also caused in a considerable proportion of cases by the pneumococcus, though other organisms such as the influenza bacillus, Friedländer's bacillus and streptococci may be responsible. Little need be said concerning this condition when primary. It has neither a very high rate of incidence nor of mortality, though it helps to swell the total of the sputum-borne diseases. Primary broncho-pneumonia should not be confused with the pneumonia which appears as a sequel to measles, which is very serious and which will be discussed under that disease.

Influenza.[2]—True influenza, of course, is caused by the *B. influenzae.* In such cases, the organism is constantly present in the sputum. The organism is very delicate and can only be cultivated in media containing blood. It is very easily killed both by heat and by drying, so that it is stated that the organisms die within one or two hours in dried sputum. It is probable, therefore, that this disease is spread entirely by direct transference of sputum or nasal discharges, mainly as a droplet spray from the sneezing or coughing patient; and for the rest by the fingers of the patient

[1] The actual figures collected from cases of pneumonia in the service are even less encouraging. Thus, of 2,721 cases that were typed, 25.1 per cent were Type I; 16.2 per cent were Type II; 5 per cent were Type III, and 53.6 per cent were Type IV. The number of Type I cases, the only ones in which the serum is of value, are less proportionately than in the previous figures given. Moreover, of 409 Type I cases who were treated with the serum, the mortality was 7.8 per cent; and of 222 Type I cases who were not treated by the serum, the mortality was 12.6 per cent. This makes no very strong showing for the serum.

[2] This paper was written before the great epidemic which began in September, 1918. While some doubt has been expressed as to the etiologic relationship of the *B. influenzae,* it may be said at present that with proper technique this organism may be found in practically all cases; that up to date no other organism has been incriminated; and that although the *B. influenzae* cannot be accepted with certainty as the cause of influenza, it is still the most probable cause.

which have been soiled with the infectious secretions. The infectiousness of the condition is such that, when the disease appears in a house in one individual, it commonly spreads to the other members of the family even when efforts are made to "screen the sneeze" behind a handkerchief. In such cases soiled fingers complete the infection even though droplet infection is prevented. The spread of such a disease in a military camp is necessarily rapid.

During the past year influenza has reached epidemic proportions. Nevertheless, it is not believed that all the cases carried on the sick report under this heading were true influenza; and probably many cases were what is known as "common cold." The common cold has been ascribed to many organisms, including the pneumococcus and the streptococcus, and these organisms are certainly present in many cases and are widely distributed through the sneezing and coughing. However, recent investigations (7) have indicated that colds are caused by a filterable virus.

The exact diagnosis between a severe cold and influenza can only be made on the basis of careful bacteriological investigation of the sputum. And as the isolation of the *B. influenzae* is a rather delicate piece of technique, this work is seldom done. A mild cold is ignored and is not admitted to sick report; and a very severe cold is usually admitted either under the heading of bronchitis or influenza. These mild and ignored cases are frequently quite as infectious as the more serious cases; and, as the individual continues on duty, he serves as a very active carrier of disease organisms. The wide diffusion of virulent pneumococci and streptococci, in the mouths of healthy men or measles cases, is probably caused by these coughing and sneezing individuals who remain on duty. In this connection, the work of Valentine (8) is interesting. Valentine recovered pneumococci from 43 out of 65 cases of common colds, as follows: Type I, 2 cases; Type II, 2 cases; Type III, 4 cases; Type IV, 35 cases. It was not possible to determine whether the cold was an infection caused directly by these pneumococci. But in either case the possibility that such common colds act as the disseminators of the organisms that cause lobar pneumonia must be considered.

The average medical officer would have a chill at the idea of hospitalizing all cases of colds, and perhaps this could not be done because of the interruption of discipline and for other military reasons. At the same time I confess I would like to see this policy tried in some camp. Colds are apt to be only sporadic during the summer and to become epidemic during the cold weather. If all such cases were hospitalized during the summer, they would not form a very large total, and it is believed that the usual epidemic in the fall and

winter could be prevented or much restricted. When we consider that it is not only the common cold that may be thus prevented, but the distribution of those organisms that cause the more serious conditions, such as measles, pneumonia, and cerebrospinal meningitis, the suggestion seems to be worth at least a trial.

As bronchitis is one of the results either of the common cold or of influenza, it will be unnecessary to discuss this condition at greater length. It may be noted in passing that the admission rate for influenza and bronchitis combined during the past year, was higher than the admission rate for all venereal diseases.

Tonsillitis.—This condition has been one of the most frequent causes of admission. It is also a more serious condition than is indicated by the death rate, as shown in the sick report. Many systemic infections are acquired through the portal of the tonsils, including acute articular rheumatism and other more chronic joint inflammations. The tendency of the heart to be affected in rheumatism is well known. Many of the mitral lesions that cause death later in life are the result of primary tonsillar disease, as are also pericarditis and other inflammations of the serous membranes, and a certain proportion of the general septicemias. The deaths and disability caused by many of these diseases should more properly be ascribed to tonsillitis, which would greatly increase the rates, already high, of the sputum-borne diseases.

Tonsillitis may be caused by a variety of microörganisms; but the commonest causes are the pyogenic cocci, including the staphylococcus aureus and the streptococci. More rarely the condition is caused by the spirillae and fusiform bacilli of Vincent's angina, and this infection has become prevalent on the western front under the names of "trench mouth" and "trench throat." In tonsillitis there is little coughing or sneezing, so that droplet infection probably plays a minor rôle in the dissemination of the disease. Transfer of saliva through close contact is the usual method of infection, though the possibility that the disease may be contracted from dried and pulverized sputum in the dust must be considered. The pyogenic cocci are very resistant in the dried state and may live for months. Like other sputum-borne diseases there is a tendency for tonsillitis to become epidemic during the winter months. This peculiarity will be discussed later.

Measles.—This disease has probably caused more anxiety than any other one disease during the past year. The rate of admission has been high, particularly in the camps in the south and west, as has already been pointed out, and the mortality has been higher than that from any other disease. This mortality is not due to

measles alone, for the death rate from uncomplicated measles is not high in adults. It is due chiefly to the so-called measles pneumonia, which is a frequent complication or sequel of measles.

The organism that causes measles is not known, but it is believed to belong to the group of filterable viruses. Experiments on monkeys have indicated that the virus is present in the buccal and nasal secretions, and universal experience indicates that these secretions are infectious from the very beginning of the disease until convalescence, and that this infectivity is at its height at about the time of the appearance of the exanthem. Experimental evidence indicates that the disease cannot be transmitted by the scales, so that it is preëminently a sputum-borne disease. The main difficulty in controlling measles lies in the fact that the disease may begin like a common cold and is highly infectious at this period before the diagnosis is made. In the close contact that inevitably occurs in a tent or barrack, the patient's neighborhood is almost surely infected by the droplets expelled in sneezing and coughing; and as the infection is one of the most certain known to medicine, unless very energetic measures are taken the epidemic is only limited by the amount of susceptible material. It is highly improbable that infected bedding and clothing play any important rôle in the transmission of this disease. The virus is undoubtedly deposited upon bedding and clothing, and it must be said that we do not know how long it is capable of maintaining its infectivity under these circumstances. Many sanitarians believe that such articles should be disinfected, and Munson (2) emphasized the use of sun and fresh air as disinfecting agents. It would seem on *a priori* reasoning that the virus on bedding and clothing is rather unlikely to find its way into the mouths of other men, and that by far the greater emphasis should be placed on the droplet infection and personal contact with the soiled fingers of the infected man. But, wherever our theory leads us in this matter, it is obvious that the clothes of the soldier are in no danger of getting too much fresh air and sunlight, and that orders should be strict that the personal belongings of the men should be regularly and daily aired and sunned. Measles may afford an additional reason for performing efficiently what should be done in any case.

Measles usually affords a complete and permanent immunity to further attacks. The incubation period is commonly given as from seven to fourteen days. Munson states that in the epidemic on the border it was practically always fourteen days. These facts give us the clue as to the measures to be taken to prevent this disease. In addition to the general measures that should be taken to prevent

all the sputum diseases, and which will be discussed later, the following special measures are recommended:

1. Measles, like most of the other sputum-borne diseases, is a cold weather disease. When cold weather approaches and the respiratory diseases begin to appear, be on the lookout for the first cases of measles. Their prompt detection and isolation may prevent the disease from becoming epidemic, especially if their contacts are also isolated from the rest of the command.

2. Each organization surgeon should determine which men have had measles and are probably immune, and which men have not had measles and are certainly susceptible. All men who have not had measles are susceptible.

3. All cases of coryza or bronchitis among non-immunes, especially if accompanied by increased temperature, that may appear at a sick report or can be detected by regimental surgeons at an inspection, should be isolated in small groups of three or four in tents. If the disease is measles, the fact can be determined in three or four days on the appearances of the eruption. It is necessary that the isolation be in small groups, in order to return the majority of the men to duty. If a large group be employed, a case of measles is more likely to appear, after which the entire group will have to be isolated until the disease disappears from that group.

4. Isolate all non-immune contacts of these suspicious cases separately, for fourteen days. These men may continue their drills or instruction under immune noncommissioned officers.

If these measures are taken promptly before the appearance of measles, or after the appearance of the first case, it should be possible to prevent the disease from becoming epidemic.

Measles Pneumonia—The Hemolytic Streptococci.—Pneumonia is a very common complication of measles. It may be lobar and caused by the pneumococcus but is more frequently lobular and caused by hemolytic streptococci. The common history is that a measles convalescent suffers from a chill with pain in the side and fever. An exploratory puncture may detect pus. Necropsy shows that the process is a lobular pneumonia from which hemolytic streptococci can be isolated in nearly pure culture. There is often also a streptococcus pleurisy and empyema (9).

Cummings, Spruit and Lynch (10) swabbed 291 measles patients; 104 of these cases had hemolytic streptococci in their throats; and among these, 51, or 49 per cent, developed complications, including 34 cases of pneumonia and 9 cases of empyema.

With regard to pneumonia, of the measles patients that harbored

non-hemolytic types, 3 per cent developed pneumonia; while among those harboring hemolytic streptococci, 33 per cent developed pneumonia. This indicates that the hemolytic streptococci are to be regarded as the causal organism of most of these cases of measles pneumonia.

Other factors are of importance in producing this complication, of which the greatest are exposure to cold, fatigue and other conditions that reduce the vitality of these patients. Measles pneumonia may be prevented, to a very great extent, by merely keeping all measles patients in bed for a period of about two weeks after recovery from the measles proper.

The hemolytic streptococci are also the chief cause of the empyemas which have caused so much trouble during the past year. One hundred and forty-eight cases of empyema were studied at Camp Doniphan (11). In an examination of the exudates, hemolytic streptococci were found in 137 cases, or 92.5 per cent. Pneumococci were found in 9 cases, or 6.1 per cent; and the *Streptococcus viridans* in 2 cases, or 1.4 per cent.

Where do these streptococci come from? They undoubtedly come from the mouth and throat. In the course of a survey for meningitis made from January 1 to March 1, 1918, at Camp Doniphan, cultures were taken from the nasopharynx, and about 20 per cent of the cultures showed the presence of hemolytic streptococci in normal individuals. Cultures taken from the nasopharynx and tonsils of 38 empyema cases revealed the presence of hemolytic streptococci in 22, or 57.9 per cent. Cole and MacCallum (12) found that a very large number of patients suffering from acute lobar pneumonia have hemolytic streptococci in their throats, and that, when the infection is once started in a ward in which the patients are closely associated, the streptococci become widely distributed and probably gain in virulence.

The information that has accumulated from such observations indicates that hemolytic streptococci are fairly common inhabitants of the normal mouth and throat. They probably cause little trouble until for some reason the vitality of the patient is reduced, as by measles, exposure to cold and other factors. But when the vitality is so reduced they occasion a very fatal form of pneumonia, often associated with pleurisy and empyema.

Under ordinary conditions, in a barrack where contact is close, these streptococci are distributed more widely like other sputum-borne organisms. The same thing occurs in a crowded ward, and here the liability to the development of pneumonia and empyema is much increased because all the patients in the ward are reduced

in vitality. Under these circumstances the disease becomes frequent instead of occasional.

The prevention of these infections in hospitals depends largely upon keeping patients warm in bed and preventing the transfer of the infectious sputum. This may be accomplished by making all patients wear masks, as has been recommended by Capps (13). A simple face mask for this purpose has been described by Dannenberg (14). Together with the mask, some modification of the cubicle system should be used. At least screens should be placed between all beds, so that the droplets cannot be coughed from one bed to another, and the patients should be compelled to wear the masks when not in the cubicle. Such measures should be taken in all wards devoted to diseases that are transmitted by the sputum and nasal secretions, and might well be adopted in the entire hospital.

With regard to the barrack, the measures that will reduce the dissemination of the streptococci are precisely the same as those taken for all the other sputum-borne diseases.

Mumps.—The admission rate for mumps is not as high as that for several of the diseases that have been discussed, and its mortality is practically nil, yet the disease is of considerable importance because it results in a long period of hospitalization; and, because of its long incubation period and long period of infectivity, it is a most difficult disease to control by the usual methods of isolation. The organism that causes mumps is unknown, but is probably a filterable virus which is present in the saliva. Wollstein (15) has produced parotitis in cats with filtered bacteria-free saliva from cases of mumps and has shown that the saliva is most infectious during the first three days of the disease, is less infectious on the sixth day, and that infectivity cannot be demonstrated after the ninth day. On clinical evidence it has been stated that mumps may remain infectious for six weeks, and perhaps in rare cases this might be so. For, if one gland is infected at first, it is possible for other glands to be infected later, thus prolonging the infectious period. At the same time it appears that the isolation of cases of mumps for six weeks, as usually practised, is hardly necessary. Especially when the infection has been bilateral from the start, the period of isolation might well be reduced to three weeks. This reduction in the period of isolation will have a marked effect in reducing the non-effective rate for this disease. The incubation period is from two to three weeks, so that contacts who are isolated must be observed for three weeks.

As there is little coughing, droplet infection can be of little importance in the dissemination of the disease; but immediate con-

veyance of saliva from one to another by means of soiled fingers, common drinking cups, pencils, eating utensils, and similar methods, probably constitutes the main method of conveyance. Isolation of those infected and of contacts may and should be practised, but in the past these methods have had little effect in checking the disease. The main reliance must be placed upon the measures which should be taken to prevent the transfer of infectious sputum and saliva.

Scarlet Fever.—This is a much more serious disease than mumps, and yet it is relatively unimportant in the military service because it is comparatively infrequent, and cases are generally sporadic, there being little tendency for the disease to become epidemic. Here, again, the organism that causes the disease is unknown, but the best evidence indicates that the secretions from the nose and throat are probably the only source of infection. It has been impossible experimentally to produce the disease with the desquamated scales which were formerly thought to be so infectious, and fomites, as the term is usually understood, probably play no part in transmission. This of course does not include indirect contact with objects that have been recently soiled by infectious secretions. When a drinking cup or other object soiled with infectious saliva is soon after placed in the mouth of another person, we do not consider these objects as fomites. However, the definition is unimportant, if the method of transmission is understood. The bedding and clothing, which would have been considered highly infectious a few years ago, are of little or no importance, the main source of infection being the patient himself, through the wide dissemination of his sputum. No one knows how long scarlet fever remains infectious, and the period of isolation is therefore arbitrary. Four weeks has been generally accepted as a safe minimum. As actual cases of scarlet fever are always isolated in the hospital, it is probable that the chief transmission of the disease is by carriers or missed mild cases of the disease. Reduction in the amount of this disease will therefore also depend mainly on the general measures that are taken to prevent the interchange of sputum and saliva.

Whooping Cough.—This disease, as indicated in the tables, is practically non-existent in the Army, and need not be discussed at length. The organism that causes the disease is a small bacillus isolated by Bordet and Gengou in 1900. This organism is present in the sputum, and the secretion is probably most infectious during the early or catarrhal stage. This means that the patient continues at large disseminating the infection, for the diagnosis is rarely made before the "whoop" appears. In many cases the parox-

ysmal stage probably never develops and the patient remains free during the whole course of the disease. This affords another argument for the isolation of all cases of the "common cold."

Diphtheria.—Although this disease was formerly most serious in its consequences, it is also of relatively small importance in the military service. Its incidence is relatively small, being less even than that of scarlet fever; the disease is readily cured by antitoxin, the earliest and most satisfactory of the curative sera, and sanitary methods for the control of the infection are well defined and generally understood.

The disease is caused by the Klebs-Loeffler bacillus, or *B. diphtheriae,* which is present in the throats of patients and is transmitted to the healthy by the transference of nasal or buccal secretions containing the organism. The bacillus withstands drying, so that soiled objects may retain their infectivity for considerable periods. In spite of this, the disease is probably usually transmitted chiefly by fresh sputum, either in the droplets expelled in coughing or talking or by direct and indirect contact. As most cases of diphtheria are isolated, it is probable that the spread of diphtheria is mainly due to contact with carriers of the organism or mild missed cases. The control of the disease is therefore based upon the detection of these carriers. When a case occurs in an organization, nose and throat cultures should be made of all men in the organization, and they should in addition be given the Schick test. The men harboring diphtheria bacilli should be isolated, and those having a positive Schick test should receive a prophylactic injection of antitoxin. The main military problem comes in the treatment of the carriers so detected, for it is frequently necessary to keep these otherwise normal men in hospital for long periods, thereby interfering with their training. This may be reduced to a minimum by performing virulence tests. It has been found that many such carriers are harboring bacilli that are morphologically diphtheria bacilli, but which are avirulent; that is, when injected in pure culture in a guinea-pig, these cultures do not kill the animal and do not even cause any local inflammation. As these organisms can hardly give rise to diphtheria, the men who harbor these avirulent strains may be released from isolation.

The treatment of the carriers of virulent strains is eminently unsatisfactory. In general, it may be said that none of the methods recommended has been found successful in shortening the period during which the organisms are found. Some of the methods, by irritating the throat, rather prolong the period of isolation. A mild

antiseptic spray and gargle, such as Dobell's solution, is probably as effective as the more heroic treatments.

As in the other sputum-borne diseases, our main efforts to prevent should be aimed at the prevention of the promiscuous transfer of sputum that occurs at all times, but particularly in crowded barracks.

Cerebrospinal Meningitis.—This disease has caused an amount of anxiety and a dislocation of our military program out of all proportion to its rate of incidence. There are fewer cases of meningitis than of any other disease that has been discussed except whooping cough. Although a very fatal disease, the death rate, as shown by the sick report, is only about half that of measles and pneumonia, because of the much higher incidence of the two latter diseases. The disease inspires terror solely because of its high mortality and the disabling complications which so frequently occur. Although we speak of it as becoming epidemic, the disease is in reality only sporadic and never assumes real epidemic proportions like influenza or measles. Probably almost all individuals are susceptible to influenza and all are susceptible to measles who are not protected by an antecedent attack. Apparently relatively few individuals are susceptible to cerebrospinal meningitis. We are forced to this conclusion by the fact that the disease does not spread in epidemic fashion, and because so few of the detected carriers succumb to the disease.

However, it must be borne in mind that the meningococcus, the organism that causes the disease, may be rather widely distributed. It is probable that the disease should not be regarded as meningitis, but as an infectious rhino-pharyngitis in which the meninges become involved in from 10 to 20 per cent of the cases.

During the last few years it has been found that there are a number of different strains of the meningococcus which fall into certain groups. The grouping that has been chiefly used in this country is that described by workers from the Rockefeller Institute, namely, Normal, Intermediate A, Intermediate B, and Parameningococcus. Most of the strains that have been isolated in this country fall into one of these four groups, but occasionally atypical strains are encountered; and it may be said that the grouping of the meningococcus is not nearly as clearly defined as is the grouping of the pneumococcus, and that new and better classifications may be expected in the future as new, and at present atypical strains, are identified and classified.

The transmission and epidemiology of meningitis are something of a puzzle. All of our present information indicates that its dis-

semination is due exclusively to carriers of the organism. The meningococcus is incapable of life outside of the body. It perishes as soon as it is dried, and therefore cannot be transmitted on fomites or even very frequently by indirect contact. This organism stands as a complete proof of the almost universal interchange of saliva and sputum which is so repulsive to our esthetic sensibilities. All carriers of this organism must have received infected secretions from some other person, either a case of the disease or a carrier. Although it is unusual for physicians and nurses to contract meningitis, unless all attendants are masked the majority of them become carriers of the meningococcus. The fact that under such conditions meningitis does not become as widely prevalent as influenza or measles can only be ascribed to the immunity which most people must possess to the infection.

All of our methods of control, therefore, have hinged on the detection and isolation of the carrier. This involves a very complicated laboratory technique; the swabbing of large organizations or even of the entire command, and the isolation of all carriers detected.

It is this that dislocates the military program, for it takes time to swab a regiment, and the organization must remain in isolation until the swabbing is completed and the carriers withdrawn if any good is to be accomplished. Not only this, but all carriers cannot be detected on one swabbing, so that the operation must be repeated two or three times if all carriers are to be withdrawn. And what can we hope to accomplish if all of the carriers are not withdrawn? Obviously very little, for if only a single carrier is left behind, in a few days he may have infected many more men. The great liability of physicians and nurses to become carriers indicates that under the ordinary barrack conditions one carrier should shortly produce many others.

The treatment of the carriers withdrawn is also unsatisfactory. Some of these men lose their organisms in a short time; but many are what is known as chronic carriers, and, so far, all attempts to eradicate the organisms from these chronic carriers have met with little success. Such carriers cannot even be discharged, for no civilian community wishes to receive men who may be the originators of an epidemic.

A most interesting fact in this connection is that these carriers so seldom develop meningitis themselves. This becomes still more interesting when we remember that there are several groups of meningococci and that no endeavor has been made to separate the carriers of the different groups. Thus the man who carries the nor-

mal strain does not develop meningitis because we assume him to be immune to that strain. But he is in close contact with the carriers of the other three strains, and from the ease with which carriers are produced we must assume that it is only a short time before he acquires the other strains. Still he does not develop meningitis. To explain this fact it seems that we must assume that the great majority of men are immune to all the strains of the meningococcus.

For this reason it seems probable that other factors must enter into the development of the disease. The tendency for this disease to attack young soldiers, and particularly new recruits, has often been emphasized. What is there about the life of the young soldier that is different from the lives of other young men of the same age and walk of life in the civilian community? The answer to this question may well give us the contributory or predisposing causes of meningitis. The soldier's life differs in many respects from that of the civilian, but usually to the advantage of the soldier so far as hygiene and sanitation are concerned. The soldier is usually better fed and housed than the civilian. There are two factors, however, in which the civilian has the advantage, the soldier suffers more from fatigue and cold.

The soldier cannot regulate his work, which is fixed by routine, by the exigencies of the moment or by the orders of his officers. In civil life he may not have been accustomed to any physical labor, and in the process of physical training which is to make a soldier of him there are many times when such men are fatigued. A man may be already tired when he is called upon to go on a practice march or to take an extra turn at fatigue duty, perhaps for the infraction of some minor regulation. In the actual campaign the soldier is unavoidably subject to these extra physical strains. A certain number of the weaker men succumb in various ways, and some go by the meningitis route.

I believe that exposure to cold is even more important in the production of meningitis than fatigue. Soldiers also become fatigued in the summer, but there is little or no meningitis during the summer months. It is only when cold weather comes on that meningitis assumes serious proportions. Now why should the soldier be more exposed to cold than the civilian? It is because his clothing is fixed by order. If his heavy clothes have not been issued, the soldier is cold. If he is obliged to go on guard on a chilly night before the overcoats have been ordered, he will be cold again. And even in the best of circumstances he is often obliged to sleep in barracks with an insufficient covering and with all the windows open for ventilation. If, in addition, he happens to be a meningitis car-

rier because of his close association with other carriers in barracks, the exposure to cold or fatigue, or both, may determine an attack of meningitis that would not have occurred under normal circumstances. Thus, in one epidemic last year, it was noticed that more cases occurred during a snowstorm and that the disease appeared to have a special predilection for the men who had been engaged in shoveling the snow—that is, the men who had been exposed to both fatigue and cold.

In view of the fact that the identification and isolation of carriers form such a difficult operation, the question may be raised if it would not be better to attempt to control this disease chiefly by the adoption of methods which will limit the distribution of infectious secretions and to lay particular stress upon keeping the soldier warm and avoiding undue fatigue. Suppose that by these measures the number of cases could be reduced a half or two-thirds? It might then be possible for the laboratory personnel to swab all contacts of meningitis cases and thus remove the remaining carriers, thereby bringing the disease under control. I believe this procedure is to be advocated rather than the method of swabbing entire organizations or commands. So far as I am aware, the adoption of general swabbing did not bring the meningitis in a single camp to an abrupt end. Though theoretically perfect, this method is mechanically faulty. There was not a sufficient laboratory personnel in any camp to swab all the men of the command and pick out the carriers efficiently. To be successful this work must be slow and painstaking. When performed under pressure by an insufficient or half-trained personnel, it is certain to fail. Undoubtedly some carriers will be detected, but, unless all are detected and removed, there are apt to be return cases in that organization, necessitating a second isolation and re-swabbing.

It may be said, therefore, that the swabbing of entire organizations swamped the laboratory personnel under a burden of examinations that it was physically impossible to make in the manner necessary to the success of the operation; the isolation of organizations to await the detection of carriers and for the re-swabbing always necessary was a great setback to the training of these organizations; and, finally, that the adoption of this very laborious and cumbersome method failed signally to abort meningitis in a single camp, although the operation probably reduced the amount of the disease and shortened the epidemic.

The fact that the success of these measures was dubious or imperfect, to say the least, is a strong argument for focusing our endeavors for the next winter upon the general measures about to be

recommended, and confining our attempts to detect carriers to contacts of cases, or at least to the reasonable proportions that the laboratory personnel may be expected to cope with. This argument gains force when it appears that not only meningitis, but all of the other acute respiratory or sputum-borne diseases, may be greatly reduced also by the same measures.

General Measures That May be Taken to Prevent Sputum-borne Diseases.—From what has been said already, it is evident that the sputum-borne diseases are caused directly by the transfer of infectious sputum from the infected to the non-infected individuals, and that cold and fatigue are important predisposing causes. The measures to be taken are obviously those that will prevent these conditions.

One of the chief factors that favor the transfer of infectious sputum is the crowding of the men. Droplet infection plays a most important rôle, but droplets are only conveyed a short distance through the air, usually less than one yard. When men sleep and live with less than one yard between them, the danger of droplet infection is constant. With a greater distance, it is practically nil. This alone is a sufficient argument for allowing the soldier a reasonable space in barracks. In addition tô this it is apparent that the more men there are in a room the greater is the liability that infected individuals will be present, and the more chances there are for transmission of infectious sputum by direct and indirect contact. Also, in a crowded room there will be more dust. and it will be kept stirred up more; and several of the diseases discussed may be transmitted by infected dust. These statements are trite, for no one questions them. It has also been observed by all practical sanitarians that the respiratory diseases tend to disappear when an increased space has been allotted to each individual.

Since our soldiers have suffered so much from these respiratory or sputum-borne diseases during the past year, it is pertinent to inquire how much space they are allotted. In the present cantonments each soldier is allotted 45 square feet and 500 cubic feet; that is, there will be one foot or less between beds, and if two men happen to sleep on neighboring sides of their beds their faces will be less than one foot apart. A sneeze under these conditions is both perilous and disgusting.

All sanitary officers agree that this floor space is inadequate. Havard states that it should never be less than 6 by 10 feet or 60 square feet and that it is highly desirable to make the floor area 80 square feet. Every endeavor should be made to provide each soldier with the minimum of 60 square feet during the coming

winter, with the certainty that this will reduce the prevalence of the diseases that we are considering.

It is possible that the exigencies of our sudden mobilization and hasty constructon of cantonments may have rendered this insanitary condition unavoidable. This war was not arranged as a demonstration in sanitary methods, and we have entered it with a single object—to defeat Germany. Therefore there is not the slightest disposition to criticise what has been done in the past. It is perfectly proper to point out that a more liberal allowance of floor space in the future, if it is in any way possible, will do much to reduce the prevalence of the diseases that are now causing anxiety, not only to the military authorities but to the entire country. It would seem that, since the present barracks can hardly be reconstructed, the extra floor space could be secured by building additional barracks and enlarging the camps.

Even in the absence of additional floor space, there are certain measures that may be taken to reduce this contagion. During the past winter soldiers were directed to sleep alternately head to foot, thus increasing the distance between their faces. The adoption of this measure may have produced good results, but it does not accomplish the desired object entirely, for many soldiers slide down into the middle of the bed and curl up so that their faces may really be quite close together.

It has been suggested that paper screens should be placed between each bed, so that each soldier will practically be sleeping in a cubicle. Such screens can be constructed very cheaply of a simple wooden frame to which a heavy grade of paper is tacked or pasted, should extend from the head of the bed to about the middle, and should be about 2 feet higher than the surface of the bed. With such screens in place, droplet infection would become practically negligible during the night, even with the present reduced floor space. This will not, of course, prevent the crowding and resultant infection that occurs during the day. Nothing but more space will prevent that.

Education of the Soldier.—The average soldier does not understand the danger from the sputum and nasal discharges, and consequently he distributes these secretions very promiscuously. In one of the camps that the writer visited last year, spitting was almost universal, and the use of the handkerchief appeared to be unknown or was considered unduly effeminate. As one rode down the street, soldiers could be seen blowing their noses right and left with a heroic disregard of consequences, and if you addressed a soldier it was ten to one he would spit before he answered. Prob-

ably conditions in all camps were not so bad, but this camp was suffering from an outbreak of meningitis. All the conditions were fine for the distribution of the organism.

When the laboratory men entered a barrack where a case of meningitis had occurred in order to swab the men, the contacts would usually be found gathered around the stove, and all spitting on the floor.

Spitting should be prohibited by order, a sign to this effect should be placed in each barrack, and the order should be enforced. The necessity for enforcing this order will have to be impressed upon company commanders and the noncommissioned officers. The handkerchief should be made a regular part of the issue of clothing, and the men should be compelled to use it and trained to "screen the sneeze."

The common drinking cup is rarely met with and should be entirely abolished, and the men taught to wash their hands after blowing the nose, to keep their fingers away from their nose and mouths at other times, and not to put any object in their mouths which could have been used by anyone previously. The subject is of sufficient importance to warrant short talks in plain English, and such talks might be given by company officers, just as they give the men instruction on the subject of venereal diseases. It might be well to give a printed circular to every man.

The Predisposing Causes—Cold.—Almost all of the diseases discussed tend to become more prevalent during the cold months. This has been generally ascribed to the fact that there is a greater tendency to remain in barracks during the winter, so that there is a greater tendency toward crowding. associated with defective ventilation owing to the closure of all the windows. Such conditions undoubtedly have their effect, but they do not afford a satisfactory explanation of the great prevalence of respiratory diseases during the cold months. For people also crowd together in moving picture theaters and other places of amusement in the summer, with ventilation often at a minimum; and yet this exposure is not followed by the same consequences that attend a similar exposure in the winter. Exposure to cold must in itself be a most important predisposing cause. A few years ago before we knew so much of bacteriology it was well known that we "caught cold" or got pneumonia if we became chilled. The fact that we have learned a great deal more about the pneumococcus and other organisms should not blind us to the importance of the predisposing causes of infection. Many people carry these infectious organisms, but they do not suffer from the diseases in the summer.

The soldier is often cold. Sometimes he must necessarily suffer from the cold in the performance of his military duties. But certainly we should see to it that he is as warmly clad as possible. A great effort should be made to have overcoats and proper woolen clothing issued promptly this fall. The people throughout the country may be patient when the various reasons for a shortage are explained to them, but the pneumococcus and the meningococcus will make no allowances and will take full advantage of the deficiency. They have no more respect for civilized warfare than a German.

Sleeping cold at night is particularly bad. The men are already shivering under their too heavy but cold blankets when some efficient sanitary officer insists on opening the windows and blowing a stream of cold air upon them. Undoubtedly fresh air is good, and therefore we argue the more the better, forgetting that it makes a difference whether it is warm or cold. Do we stand out in the icy blasts in midwinter to enjoy the fresh air? On the contrary, we hurry into the house and sit around the fire.

The fad of outdoor sleeping has been responsible for much misunderstanding. People imagine that the fresh air must be good for them, even though they lie awake all night shivering with the cold. I have nothing to say against sleeping outdoors when one can keep warm.

Common-sense is as important in sanitation as the principles of hygiene. Of course ventilation should be proper and adequate. Equally, of course, the barrack should be warm enough to sleep comfortably without becoming chilled to the bone. Now a condition arises where both heat and ventilation cannot be secured at the same time. Why sacrifice heat to ventilation? Have not the leading authorities in ventilation assured us that even in the Black Hole of Calcutta there was ample oxygen to support the life of all the people in it, and that people can live perfectly well in a concentration of carbon dioxide so high that it is never reached in the worst ventilated rooms possible? What killed the people in the Black Hole? Why, excessive heat. They were packed together so closely in such a hot place that their thermo-regulating apparatus was totally ineffective. An electric fan might have saved them if their supply of air had been no greater. All of the evidence that we possess indicates that the temperature at which we live is far more important than any consideration of oxygen or carbon dioxide, because in all air there is sufficient of the former to maintain life. Ventilation is largely of importance as a means of regulating the body temperature. We like the windows open in the summer be-

cause the breeze keeps us cool. We like them closed in the winter because the wind make us cold. That the body must be maintained at its normal temperature is one of the most certain of physiological principles, and it is equally a matter of common-sense and good sanitation.

The soldier has insufficient covering. If he had enough covering, he would not object to having the windows open. The point of the argument is not that we must close the windows. It is that we must keep warm. Do it by sufficient covering if possible, and open the windows. But by all means keep warm. Why cannot the soldier be issued more blankets, or, if there is a shortage of wool, why cannot cotton comforts be issued? They are lighter and warmer than blankets. If the soldier's blankets were sewed together at the foot and two sides, and a draw string used at the top, a sleeping bag could be made that would be warmer than the blankets alone, because it would fit snugly at the neck and prevent the cold air from blowing down his back. And why cannot ventilating devices be placed in the windows so that it will be possible to secure a little fresh air without opening the whole window?

Excessive Dryness of the Atmosphere.—The methods of heating in general use—namely, stoves or steam—cause an excessive drying of the atmosphere of the room. This excessive dryness is disadvantageous in two ways. In the first place, it makes the inhabitant of the room more susceptible to the cold. A room with a very dry atmosphere will be barely comfortable to sit in at 75° F., whereas, if the proper degree of aqueous vapor is maintained, the same room will be comfortable at from 65° to 68° F. The maintenance of a proper tension of aqueous vapor in the air of barracks will therefore aid materially in keeping the soldier warm.

In the second place, in such an atmosphere water is rapidly abstracted from the respiratory passages, leaving them dry and irritated. The mechanical protection against the infection afforded by normal mucous membranes is thereby greatly reduced. The normal amount of mucus, which catches organisms and prevents their gaining access to the lungs, is replaced by dry crusts, and the irritated or inflamed mucous membrane is already prepared for the entrance of bacteria.

It is believed that this drying of the nose and throat, which occurs during the winter months as the result of living in rooms in which the air is excessively dry, is one of the important predisposing causes which result in the increase of respiratory diseases during these months. This difficulty may be entirely obviated by keeping a pan of water on each radiator. A device for this purpose has

been made, consisting of a trough containing water which is hooked over the top of the radiator, and a sheet or cloth, one end of which lies in the water. The water rises in the cloth by capillarity, and evaporation of water into the room from the wet surface of the cloth is very rapid. Such devices can be easily improvised, and sanitary officers should endeavor to have them provided for all barracks.

Fatigue.—We have also seen that undue fatigue may have a predisposing tendency to infection. Little further need be said on this point except that, if the men are being trained with the idea of strengthening them to meet the strains of war, it is a poor plan to subject them to excessive fatigue. For this never strengthens, but, on the contrary, always leaves a man weaker. Constant daily exercise up to a point that makes a man comfortably tired will end by making him stronger. Constant daily exercise just a little beyond his powers of endurance will inevitably leave him weaker. In addition he will be a ready victim to various infections. Sanitary officers should be on guard to see that the men are not over-fatigued in the endeavor to turn out trained soldiers rapidly.

Specific Measures.—The isolation of the infected is our first thought and has already been discussed under the appropriate headings. To be of any value this must be applied early when the first cases appear. I have already mentioned the possibility that, if common colds were isolated in the summer and early fall, perhaps the epidemic appearance of this condition could be avoided and the incidence of many other diseases would be reduced. When cases are isolated in hospital they should wear masks when out of their cubicles, and their attendants should wear masks. This will prevent the transference of infectious organisms to other people in the hospital who might suffer from the crossed infection, or at least become carriers, to infect other men after leaving the hospital.

It is also advisable to isolate new arrivals to camp in a detention barrack for a period sufficient to determine that they are not suffering from any of the diseases mentioned. If possible, the throats of these new men can be swabbed to eliminate meningococcus carriers. In some camps the advantages secured by this careful examination of new arrivals is largely offset by the fact that many of the men go to their homes for furloughs, and in other ways mingle freely with the surrounding population. When they return, they go directly to their companies, so that the possibility of the introduction of new infections is ever present even though each detachment of new men is thoroughly examined.

Vaccination.—The possibility of using protective vaccines must

be considered. In the case of pneumonia the procedure gives hopes of success and will be tried. It does not appear probable that a vaccine would afford protection against the streptococci. In the first place, it appears that a streptococcus infection itself does not confer immunity. Further, the separation of hemolytic and non-hemolytic streptococci only results in the formation of broad groups, the members of which may show some of the same morphological and cultural characteristics, but which differ in other respects. A recent article by Kinsella and Swift (16) comes to the conclusion that the hemolytic variety of streptococcus is homogeneous, consisting of members that are nearly identical. But this conclusion is based entirely on the observation that the different strains behaved alike in the complement fixation reaction, all the strains studied reacting in an identical way with all the antisera. By exactly the same evidence it could be proved that the typhoid and paratyphoids are all the same organism, and that the different members of the dysentery group are all identical, which appears to be a *reductio ad absurdum*. It seems probable that much more work will have to be performed before these organisms can be grouped in such a way as to afford a satisfactory basis for producing either a satisfactory vaccine or an immune serum.

Practical considerations must also be taken into account. It was well worth while to vaccinate the Army against typhoid. Practically everyone was susceptible, and the disease was a serious menace to the Army. But we have so few cases of meningitis that it would hardly appear desirable to vaccinate the entire army against this disease even if an efficient vaccine were already at hand. It has already been emphasized that probably the great majority of normal adults are immune to the disease already.

Meningococcus vaccines have been prepared, but it will be very difficult to obtain information as to their efficacy, for meningitis is so sporadic and occasional that the absence of the disease after the general use of the vaccine would constitute very little evidence of the efficiency of the vaccine. Moreover, in one camp where a meningococcus vaccine was used, cases of meningitis appeared among the vaccinated men. One swallow does not make a summer, but the value of the meningococcus vaccine is yet to be shown. Probably the best use for such a vaccine would be in camps where the disease is prevalent or on the increase, and we might soon obtain information whether the disease may be prevented in the vaccinated men.

There are many other points of interest in connection with these

diseases, but the discussion of them would carry us too far afield from the epidemiology and would make this paper unduly long. In conclusion it may be stated that, against some of the diseases discussed, there are no specific measures that will materially reduce their incidence. The more the subject is considered the more the emphasis is placed upon the importance of the general methods proposed for the reduction of all the respiratory or sputum-borne diseases, particularly an increase in floor space for each soldier and the conservation of his body heat. There may be nothing new in these proposals, but that does not affect their importance in the least. If this paper should have any value, it will be in awakening new interest in these most important requirements of the soldier.

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SANITATION IN CAMPS AND HOSPITALS ON BRITISH FRONT IN FRANCE

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Medical Corps, United States Navy

(*Concluded*)

Fly Control in Camps

IN THE base camps in the northern part of France flies are not so troublesome as they are with us. The principal point in prevention is the regular removal of horse manure. This substance forms their chief, but by no means their only, breeding ground in temperate climates, and if it can be removed to a sufficient distance from camp (at least a mile), it is not necessary to subject it to special treatment to prevent fly breeding. Such transportation, however, involves considerable difficulty, especially when large quantities have to be dealt with. In some camps it is transported to a dump on a narrow-gauge, light tram line, such as one sees used on the front in the transportation of ammunition or for transport of wounded. The gauge is about 18 inches and the weight of rails about 12 to 18 pounds to the yard. The sleepers are placed not more than 2 feet apart and properly packed. During the war it has been difficult either to sell or give away horse manure, and in many places attempts are made to incinerate it, when the quantity is not very large and the season not too wet to permit of its being burnt. As a rule, however, incineration of large quantities is very difficult, especially in northern France, owing to the frequent wet weather, and as an alternative the so-called "close packing" is being used. The success of this method depends upon the fact that the fly larvae are rapidly killed at temperatures above 114° F. and that the heat generated by fermentation in a closely packed heap of fresh stable manure often reaches 136° to 169° F. 4 inches beneath the surface. The manure is made into compact rectangular blocks of approximately 500 cubic feet contents, the base being 10 feet square and the height a little over 5 feet, with slightly sloping sides. The manure is firmly beaten down with shovels and sprinkled with a little water if the weather is dry. The blocks should be assembled on hard level ground prepared by puddling and smoothing the surface and allowing it to dry in the sun. This process of stacking manure, while less bothersome perhaps than incineration, requires considerable labor. Desiccation of manure by "spreading" suffices in warm climates, but is rarely to be carried out in northern

Europe owing to the small number of sunny days. The various chemical treatments are impracticable on active service. In camps where incineration is carried out, a simple cross trench furnace is ordinarily used. The trenches are made about 14 feet long, 2 feet wide, and 2 feet deep. The point of intersection of the two trenches

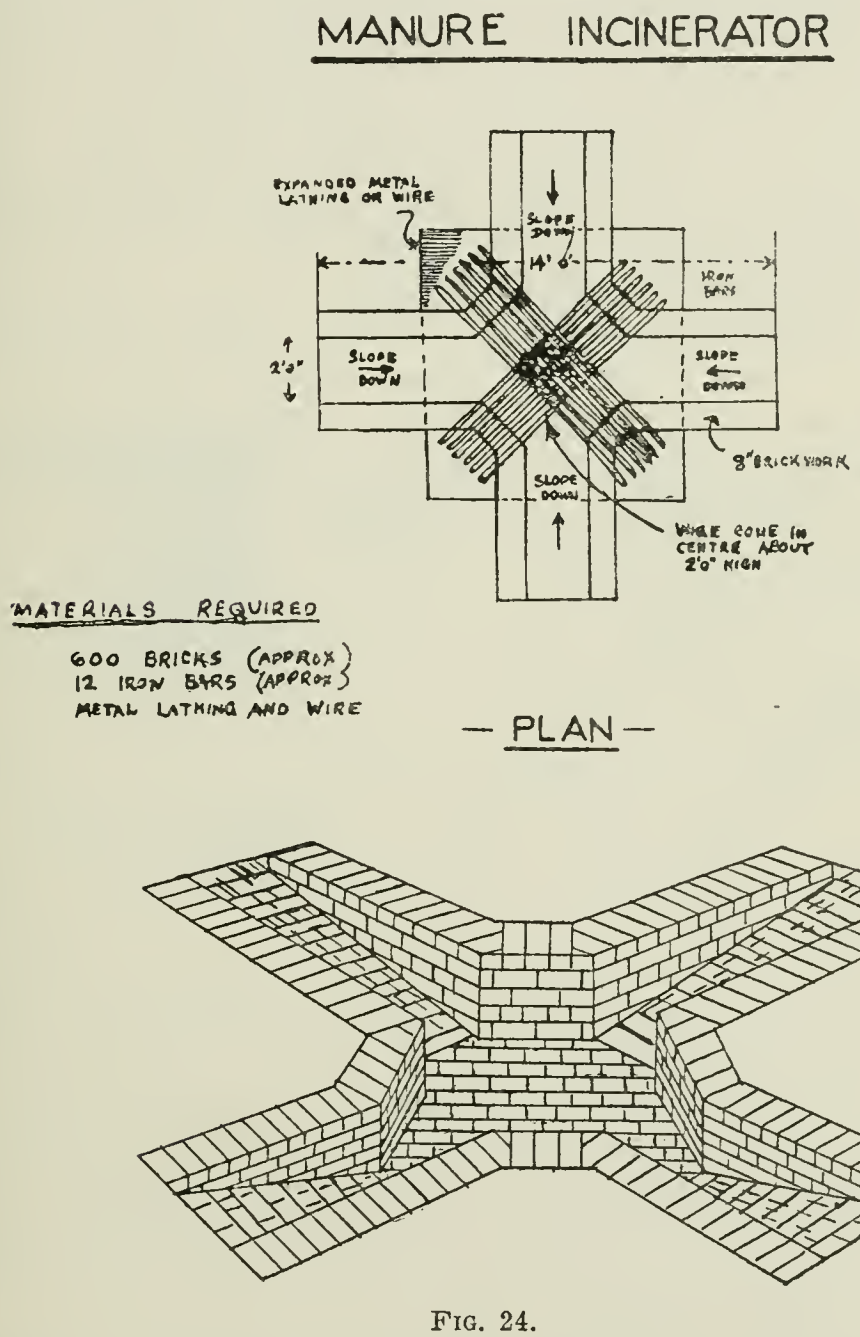


Fig. 24.

is bridged over with iron bars, Decauville rails with flanges up or old piping, spaced about one foot apart. On these are spread sheets of expanded metal with a mesh of about 2 inches by 4 inches. Over the part where the trench crosses and on top of the expanded metal is placed a cone or ball of any loose metal, such as bundles of wire

from hay bales. This cone suffices to keep the fire open. In starting incineration the dryest manure is first spread over the cone and expanded metal; above this is gradually placed other manure, the whole being lighted from below by paper or sacking soaked in kerosene. The burning sacking heats the cone and sets fire to the manure, which smoulders away. Fuel is saved and incineration facilitated by spreading the manure on a drying platform near the incinerator, from which it is gradually stoked upon the fire. The ashes drop down into the trench, from which they can be removed by means of a hoe. Manure does not burn with a flame. It is difficult to ignite and will not smoulder to ashes, unless it is supported and kept open by some such process as above. Fig. 24 shows a manure incinerator of this general type.

Next to stable litter and horse manure, human excreta form the favorite breeding ground of flies, and for this reason all latrines are designed to be as fly-proof as possible. Each morning the sanitary detachment carefully inspects the covers of deep trench latrines and of bucket latrines, to see that each lid is self-closing and fits tightly, and that all holes are carefully filled and that the woodwork is rubbed over twice a week with crude oil. It is customary to spray into the trench each morning a mixture composed of equal parts of 5 per cent cresol and kerosene, about one pint to each seat, to prevent the migration of fly larvae. The ground surrounding the mouth of the trench is covered with a strip of sacking or material fashioned from sandbags slit lengthwise. One end of the sacking is brought to the margin of the trench all around and extends out for not less than 2½ feet, the outer margin being turned vertically downward for about 6 inches. The sacking is covered with 4 to 6 inches of sand or earth. The larvae and flies are thus unable to penetrate the sacking, and they die underneath it. If sacking is not available and the nature of the earth is such as to permit of puddling or setting into hard cement, this will serve the same purpose. Finally, if neither of these plans is feasible, a furrow is dug at a distance of 18 inches from the mouth of the trench and about 6 inches wide. This is saturated with the cresol-kerosene mixture; the earth is replaced over the area and tamped down and puddled if possible.

There are at least five methods of fly destruction in vogue on the British front. Fly traps of various patterns are seen; killing with "fly flappers" is quite common; catching with adhesive material spread on wires, ropes, strings or on paper is quite frequently resorted to; while poisoning with a solution of arsenic or formalin is less common. Spraying with a solution which first paralyzes

and then kills the flies is occasionally resorted to, the basis of the spray being some extract of pyrethrum.

Of the various methods of fly destruction, one of the most effective and most easily carried out is by use of a mixture of fly glue on paper or wires. The mixture is prepared by heating two parts by weight of powdered resin to one part by weight of castor oil in an old saucepan, stirring all the time with a stick. This mixture is stiff and tenacious when cold, but when hot it is quite fluid. Wire from hay bales is straightened and cut into 2-foot lengths, one end being bent into a hook so that it can be hung on a nail. The wires are painted with the glue and then placed in a bucket made of an old cresol drum; five hundred wires are easily carried by one man. The mixture can be kept in tins indefinitely,

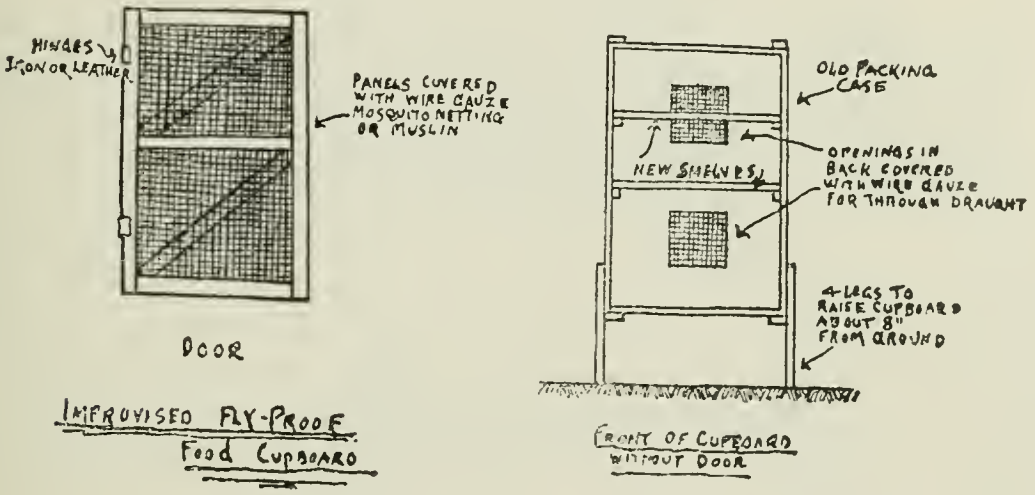

HINGES IRON OR LEATHER
PANELS COVERED WITH WIRE GAUZE MOSQUITO NETTING OR MUSLIN
DOOR
IMPROVISED FLY-PROOF Food Cupboard
OLD PACKING CASE
NEW SHELVES
OPENINGS IN BACK COVERED WITH WIRE GAUZE FOR THROUGH DRAUGHT
4 LEGS TO RAISE CUPBOARD ABOUT 8" FROM GROUND
FRONT OF CUPBOARD WITHOUT DOOR

Fig. 25.

but it is not applied to wires or papers until they are required. These wires are hung on nails in latrines, kitchens, larders and food stores. They can be suspended in tents or barrack buildings from a string or rope stretched between two poles at a distance of about 9 feet above the ground. As soon as they are full of flies or after about two days' use they are replaced by fresh wires, the used ones being placed in a furnace and burned off. These wires are then ready to be glued again and can be used all the season and stored in a dry place for the following year. There seems to be nothing in the mixture which is attractive to flies, but they like to settle on anything dark, narrow and in a suspended position. For use in a military area wires are more appropriate than fly papers, which are difficult to suspend and which blow about the camp if not secured.

PLAN OF PORTABLE MEAT SAFE

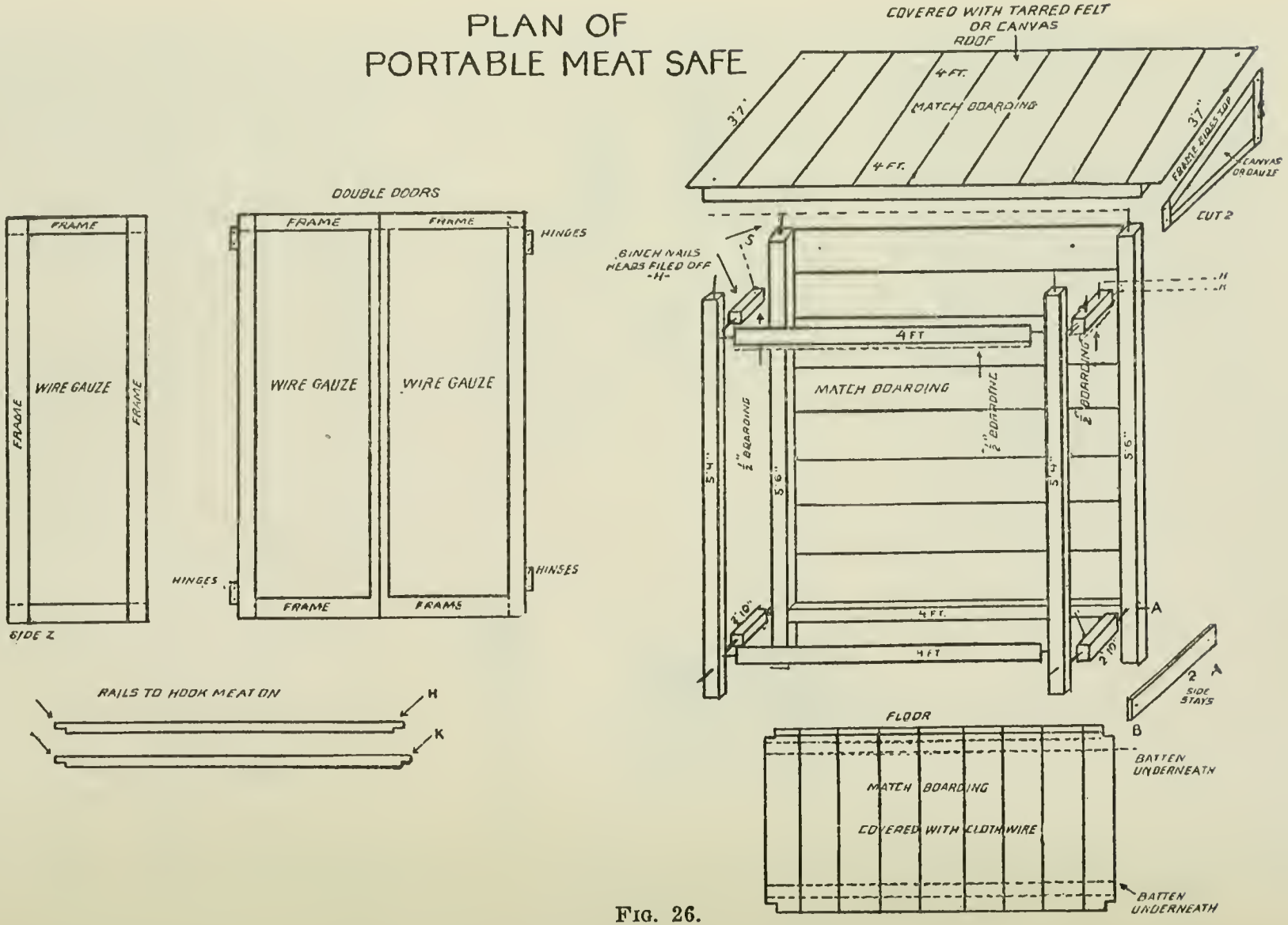


Fig. 26.

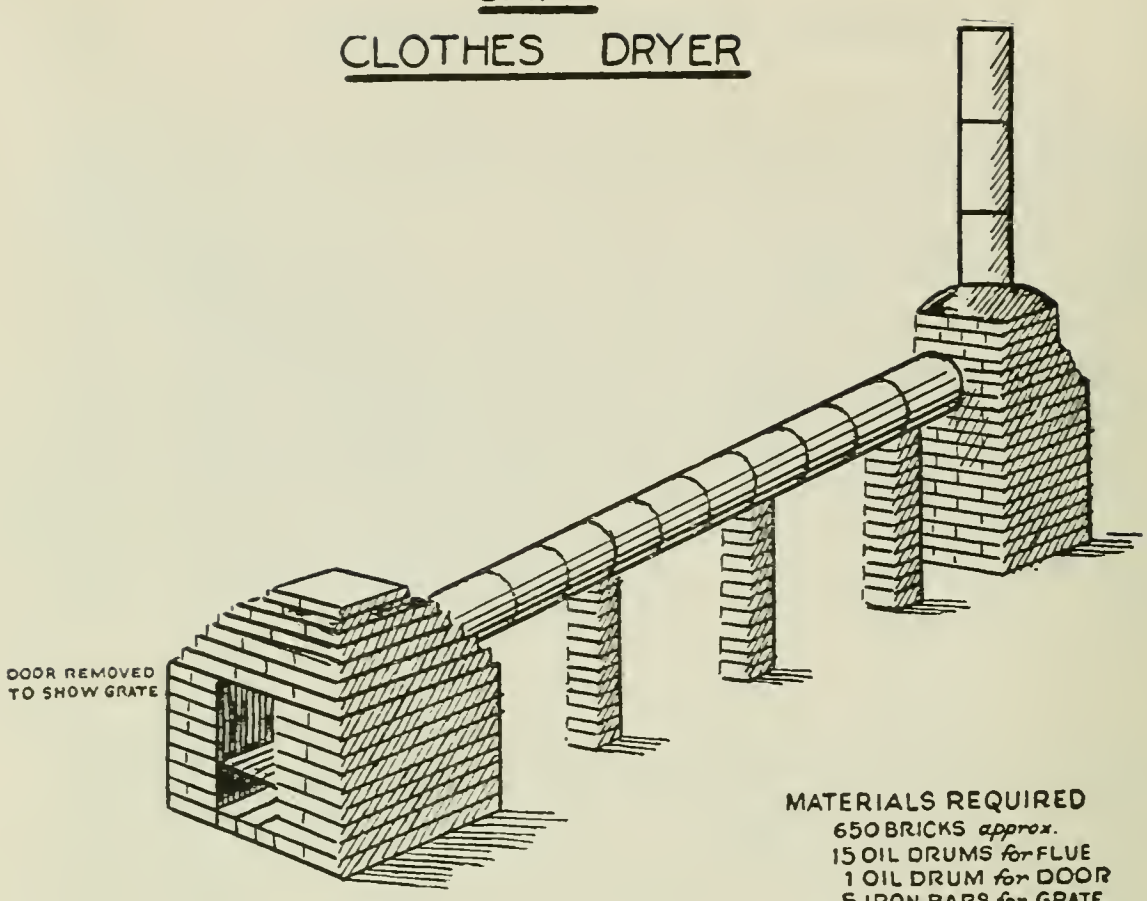
All food is kept covered by "safes" or similar means and, where possible, kitchens and dining rooms are fly-proofed by double wire gauze doors separated by a vestibule. A simple improvised fly-proof food cupboard is shown in Fig. 25. If it is found difficult to screen an entire kitchen or dining room or other place where food is stored, the food itself should be screened either by placing in a screened cupboard or safe or by being covered by screen cloth squares, which can be weighted down at the corners. Flies will breed in garbage and refuse from kitchens and cook-houses as well as in refuse about tents, so that covered receptacles at these places are generally provided. Screened receptacles are also quite necessary for the storage of mess gear. Fig. 26 shows the material required for construction of a food safe.

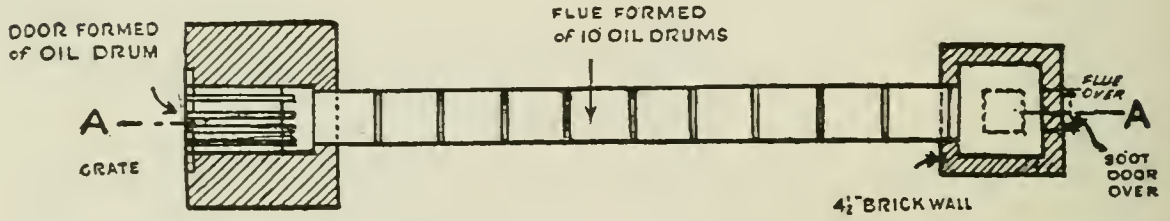
Drying of Clothing

On the western front it is not easy to keep the clothing dry during the winter, or even during the summer when there is considerable rain, but in the warmth of the latter season wet weather produces less personal discomfort. If a camp is to be occupied for more than a few days it is worth while making arrangements for drying clothes, and this may be done by apparatus built from materials usually available in all camps. An improvised camp clothes-drier is shown in Fig. 27. This is made as follows: A pipe is made of ten cresol drums by taking out the tops and bottoms and slightly tapering one end of each drum. They can then be driven together to form a pipe about 20 feet long. The pipe is supported on 9-inch piers of brick or stone. A simple furnace is built at one end with a chimney of three additional cresol drums at the other. Camp litter or rubbish is burnt in the furnace and heats the flue or pipe over which the wet clothes are supported on a light wooden framework. Above this framework another framework is built on which tarpaulins, rubber blankets or canvas is spread to keep off the rain. The drying of clothing in sleeping huts over charcoal braziers is prohibited as being dangerous, and it is not permitted to dry clothing in huts where men sleep. Improvised braziers made from buckets or tins, placed under a simple framework of poles on which are rigged ropes or wire for the support of clothing are sometimes used in a tent or drying shed. Cresol drums can be utilized as braziers, burning charcoal or coke, by punching a few holes around the sides near the bottom and standing them on a small circle of bricks.

These drums find many uses in camps. They make convenient buckets, by taking out one end and fitting with a rope or wire

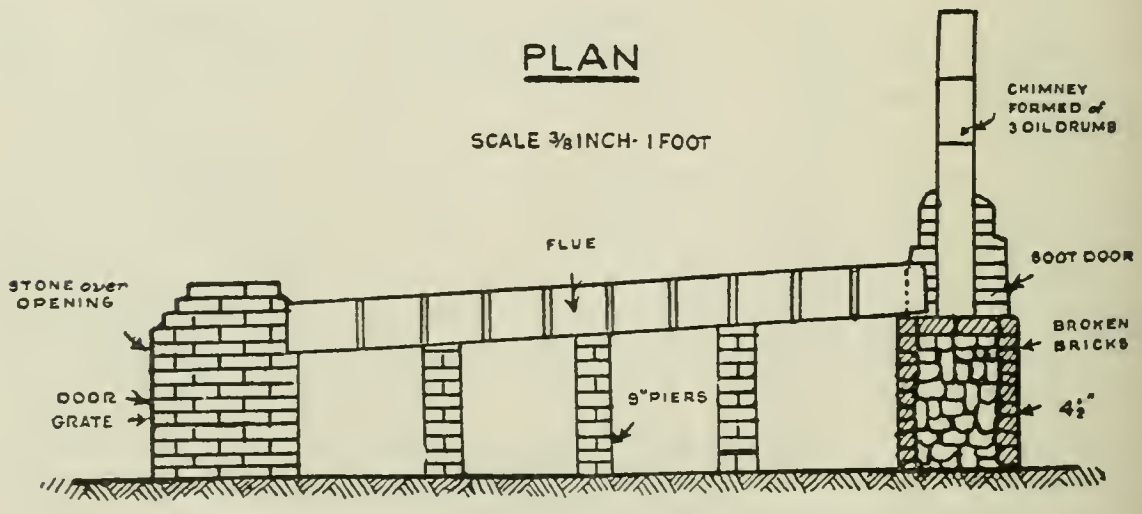
CAMP
CLOTHES DRYER


DOOR REMOVED TO SHOW GRATE
MATERIALS REQUIRED
650 BRICKS approx.
15 OIL DRUMS for FLUE
1 OIL DRUM for DOOR
5 IRON BARS for GRATE
1 TIN for SOOT DOOR



PLAN

SCALE ⅜ INCH - 1 FOOT



SECTION A A

FIG. 27.

handle, and they can then be filled with boiling salt water and placed in a dugout for heating purposes.

Field Disinfection

Field disinfection is carried out by means of several types of apparatus, some being supplied in the form of medical equipment such as the Thresh-Foden disinfector and the Clayton apparatus or in improvised form such as the "Serbian barrel," the field box disinfector, and an improvised arrangement made by fitting two rooms in a hut or shed as steam-disinfecting chambers.

The Thresh apparatus is a portable field disinfector employing low-pressure steam derived from water to which salt or saline ingredients have been added in order to raise the boiling temperature to about 220° F. The chief disadvantages in the use of this apparatus are its limited size and capacity and the time required to complete the process (one-half hour for disinfecting each charge, and one-quarter hour for drying.) The average size apparatus will accommodate about 60 blankets or their equivalent in clothing at one charge.

The Clayton apparatus is based on evolution of sulphur dioxide for chemical disinfection. It is not often seen, but is effective, although too slow for war-service requirements.

The "Serbian barrel" is constructed of a large watertight barrel the top end of which is replaced by a lid, preferably made of metal, accurately fitted. The bottom end is freely perforated. The barrel is then set up over a metal boiler which in turn rests on a brick or mud furnace with an iron pipe chimney on the side opposite to the draft and stoking trench. At the junctions of the lid with the barrel, and the barrel with the boiler, sandbag sausages are wound about to prevent leakage of steam. These barrels with separate boilers can be arranged in series over a long, narrow trench equipped as a furnace. In practice it has been found necessary to regulate the size of the boiler to insure a sufficient supply of steam to fill the barrel in from forty to sixty seconds. A drawing of a "Serbian barrel" is shown in Fig. 28.

A disinfector of ample capacity is improvised from a shed or hut with two contiguous rooms, by making these rooms double walled and filling the space between the two walls with sawdust. The rooms are about 10 feet long, 6 feet wide and 7 feet high with a door at one end and a window at the other. Hooks and ropes upon which to hang the clothing are arranged. Around the side walls are placed radiating steam pipes, through which steam from a boiler continuously circulates. A steam inlet and outlet capable

of being opened or closed from the outside is placed in the center of the floor of the room. Steam is allowed to flow into each room alternately for five to ten minutes; after drying for ten minutes more the window and door can be opened and the clothes taken out and shaken. If the steam supply has been properly adjusted, they are usually dry.

A field box disinfector which works on much the same principle as the Thresh apparatus is occasionally seen, but has the disadvantage of rather limited capacity. It is made in the form of a jacketed metal box with a separate metal boiler heated by a furnace.

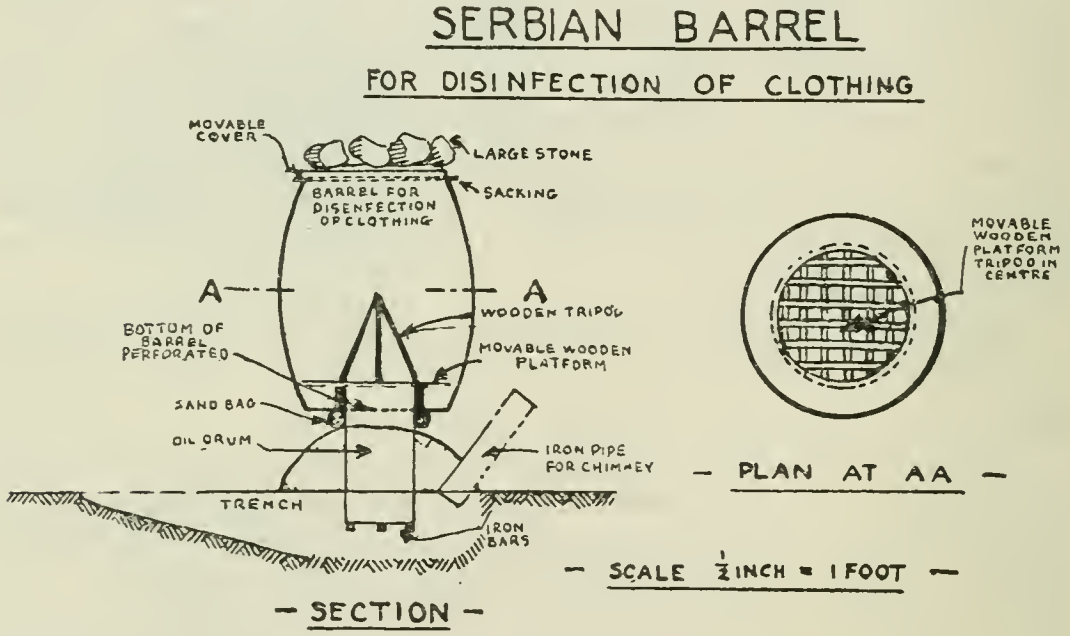
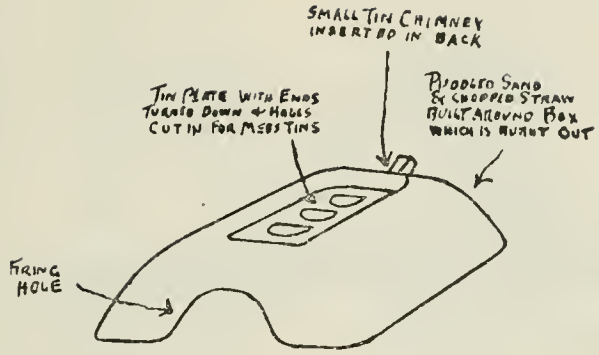


FIG. 28.

Camp Kitchens and Field Ovens

Ample provision for the supply of hot food for troops on the march and soon after reaching camp is of paramount importance, and the requirement has been met most successfully in this campaign. The cooking equipment is now carried by the first line of transport which immediately follows the marching unit, and further by providing traveling kitchens. In semi-permanent and permanent camps and hospitals not provided with ranges, etc., the cooked ration has been made more acceptable by means of improvised camp ovens and kitchens which permit the cooks occasionally to bake or roast meat, thus providing some variation from the usual stewed food.

Drawings of a number of these ovens and kitchens are shown in Figs. 29 to 36.


SMALL TIN CHIMNEY INSERTED IN BACK
TIN PLATE WITH ENDS TURNED DOWN & HOLES CUT IN FOR MESS TINS
PUDDLED SAND & CHOPPED STRAW BUILT AROUND BOX WHICH IS BURNT OUT
FIRING HOLE

IMPROVISED MESS TIN STOVE

FIG. 29.

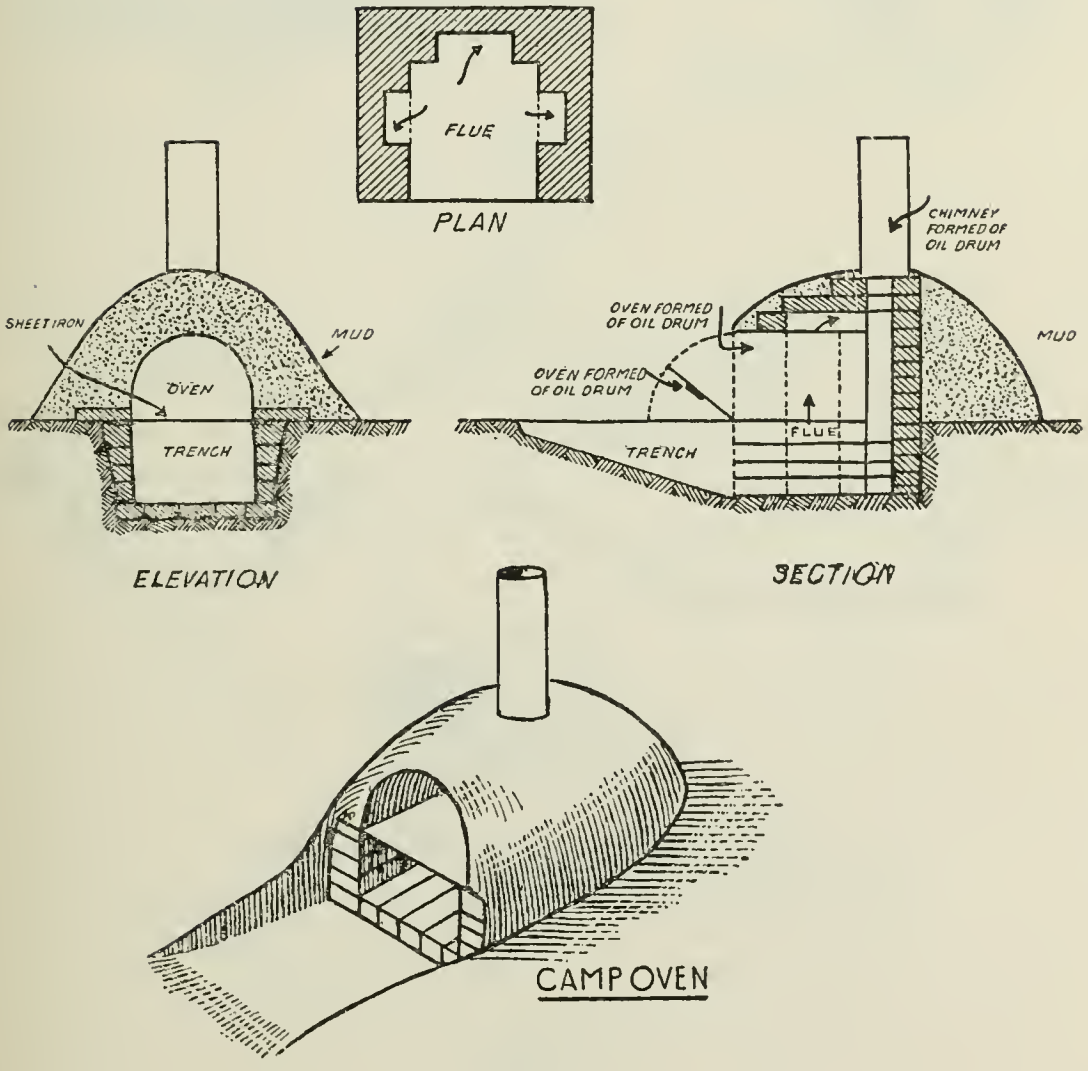
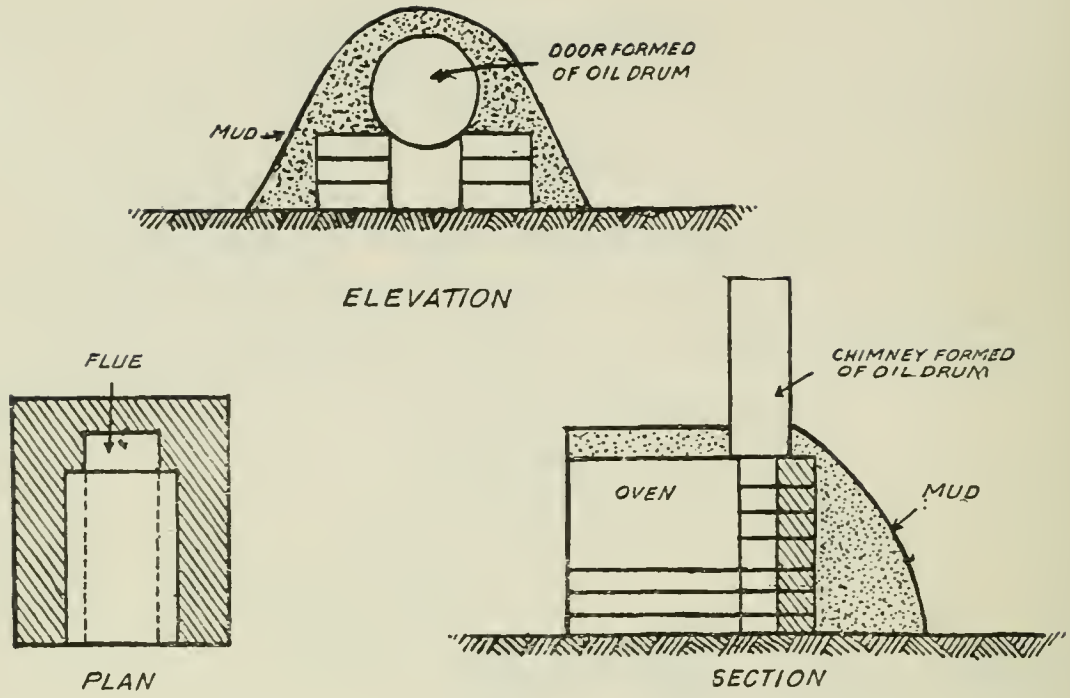
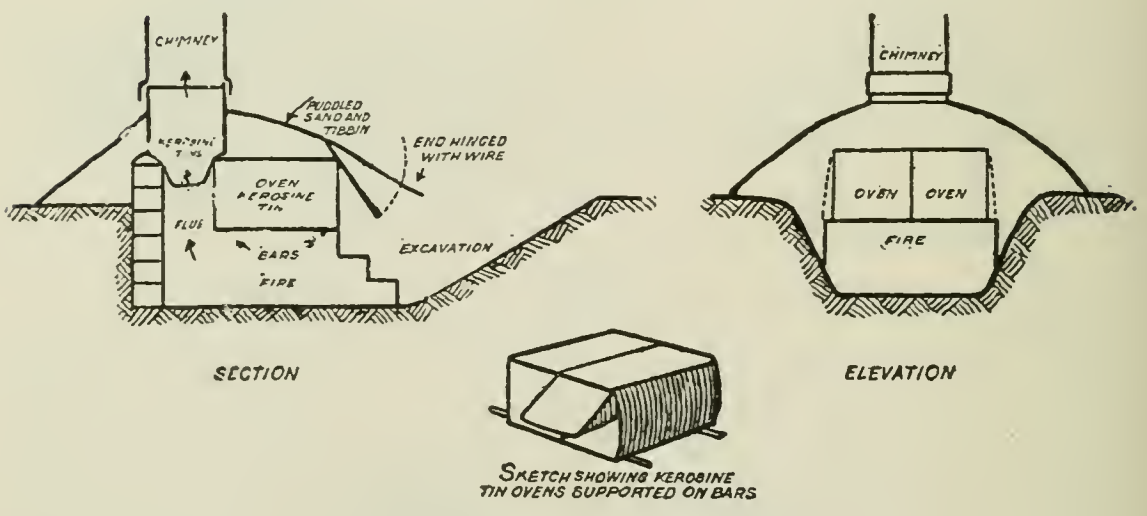


FIG. 30.



CAMP OVEN

FIG. 31.



*IMPROVISED FIELD OVEN (FOR SMALL PARTY)

FIG. 32.

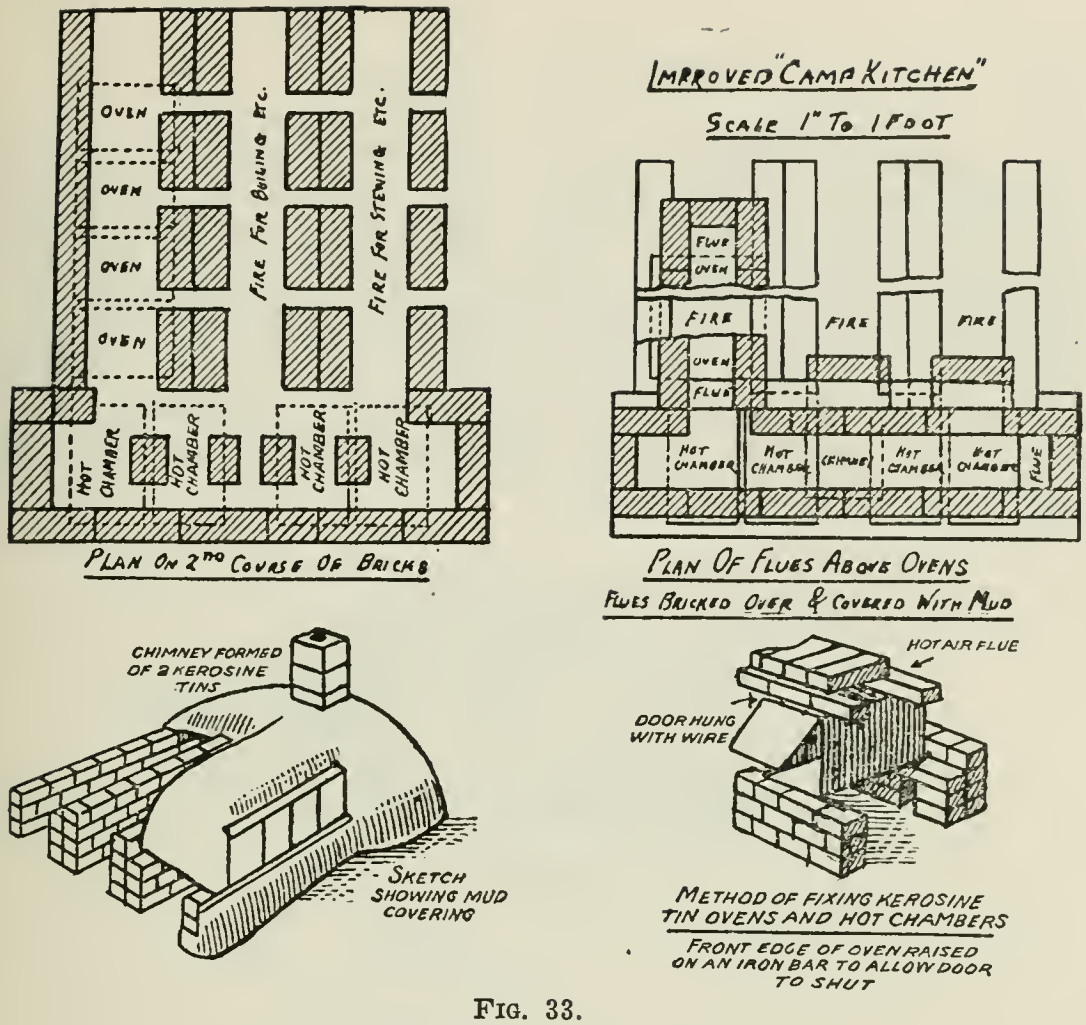

OVEN
OVEN
OVEN
OVEN
FIRE FOR BOILING ETC.
FIRE FOR STEWING ETC.
HOT CHAMBER
HOT CHAMBER
HOT CHAMBER
HOT CHAMBER
PLAN ON 2ND COURSE OF BRICKS
IMPROVED "CAMP KITCHEN"
SCALE 1" TO 1 FOOT
FLUE
OVEN
FIRE
FIRE
FIRE
OVEN
FLUE
HOT CHAMBER
HOT CHAMBER
CHIMNEY
HOT CHAMBER
HOT CHAMBER
FLUE
PLAN OF FLUES ABOVE OVENS
FLUES BRICKED OVER & COVERED WITH MUD
CHIMNEY FORMED OF 2 KEROSINE TINS
SKETCH SHOWING MUD COVERING
HOT AIR FLUE
DOOR HUNG WITH WIRE
METHOD OF FIXING KEROSINE TIN OVENS AND HOT CHAMBERS
FRONT EDGE OF OVEN RAISED ON AN IRON BAR TO ALLOW DOOR TO SHUT

FIG. 33.

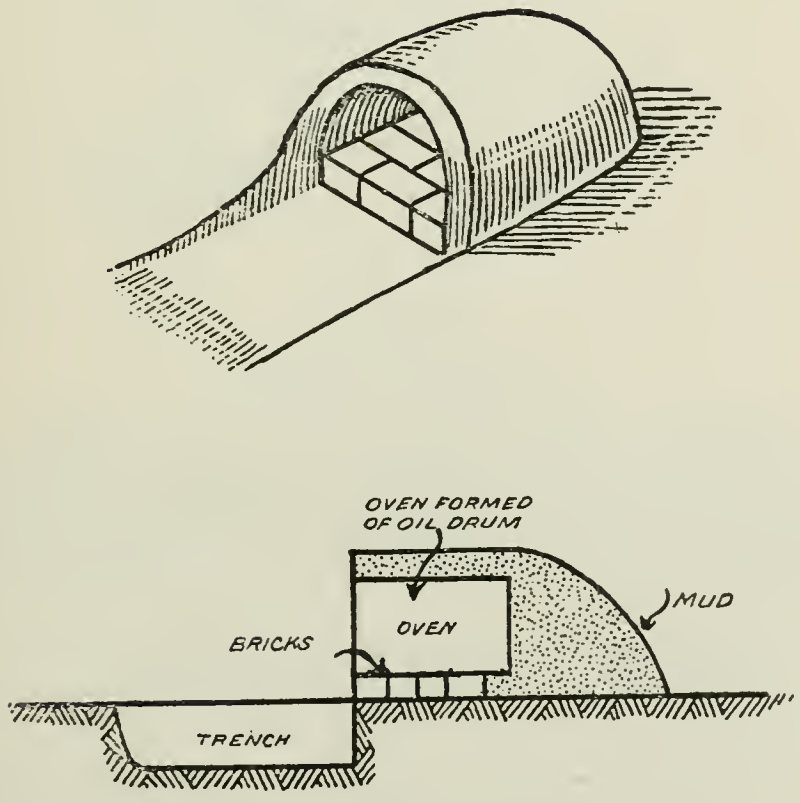

OVEN FORMED OF OIL DRUM
MUD
BRICKS
OVEN
TRENCH
SECTION

FIG. 34.

A jacketted hot box for keeping food warm while being carried forward to the trenches, and which can be used also as a fireless cooker, is shown in Fig. 37. This is constructed of a tin receptacle enclosed by a wooden box. A second and larger box surrounds the first, leaving about 2 inches of space between the two which is filled in with a layer of chopped straw or other non-heat conducting material. When used as a fireless cooker a tin of boiling water is placed in the box, together with the food to be cooked or kept warm, and the lid closed tightly.

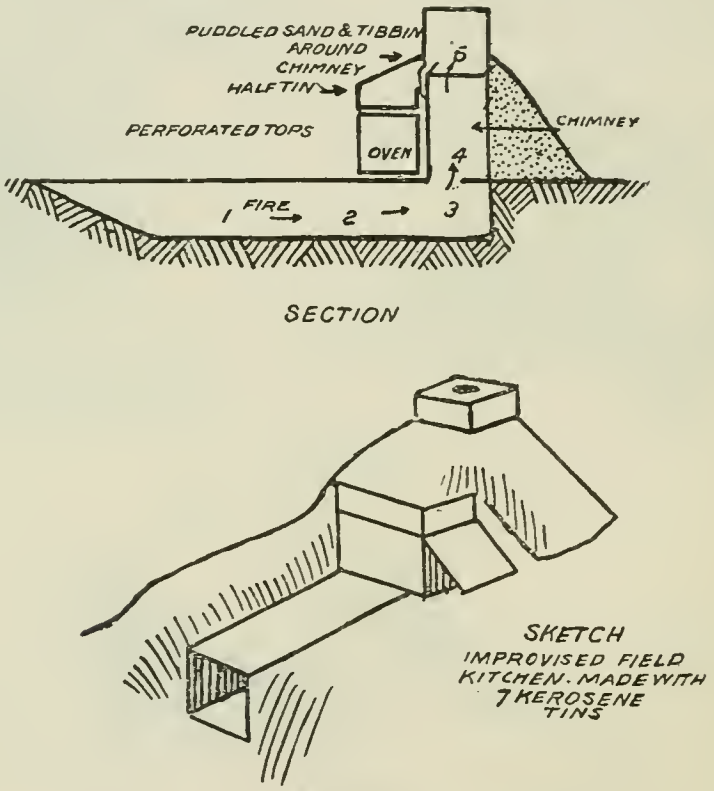


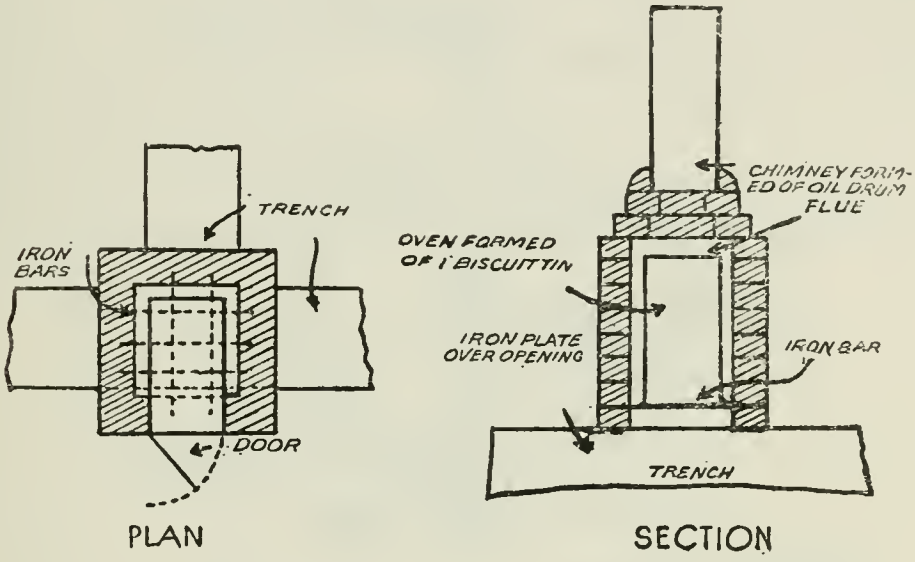
Fig. 35.

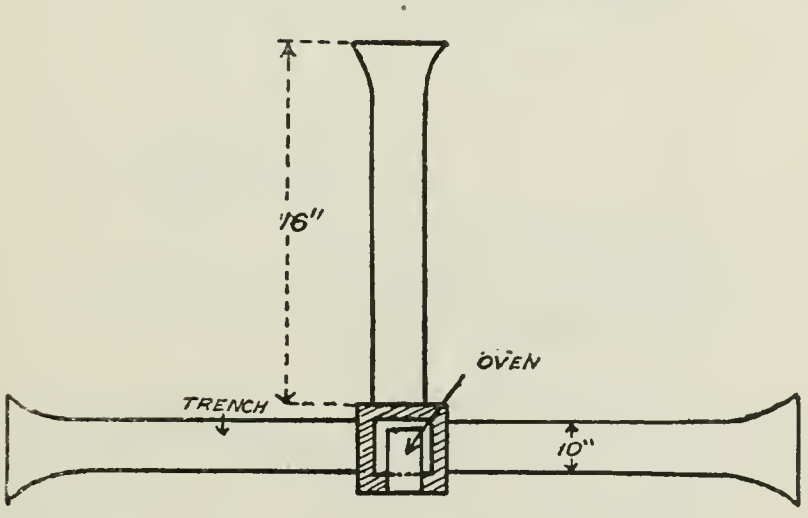
Bathing Facilities

The conditions under which soldiers in the present campaign live in trenches and billets, where they have only infrequent opportunity for bathing, are such as to render bodily cleanliness exceedingly difficult. For each divisional area one large bathing establishment and one laundry plant are generally provided, with additional smaller baths for outlying groups of men who cannot reach the central bath. The number of men with which each divisional bath deals daily varies from 1,000 to 2,000, so that it is generally possible for a man to get a bath at least once in three to four weeks. The opportunity for bathing and washing and for disinfection of clothing and bedding comes, as a rule, when the

division moves back into a rest area or the men are enabled to go to a rest camp after a tour of duty in the trenches.

Somewhere in a central position showers or hot spray baths are set up in appropriate buildings, together with facilities for dis-



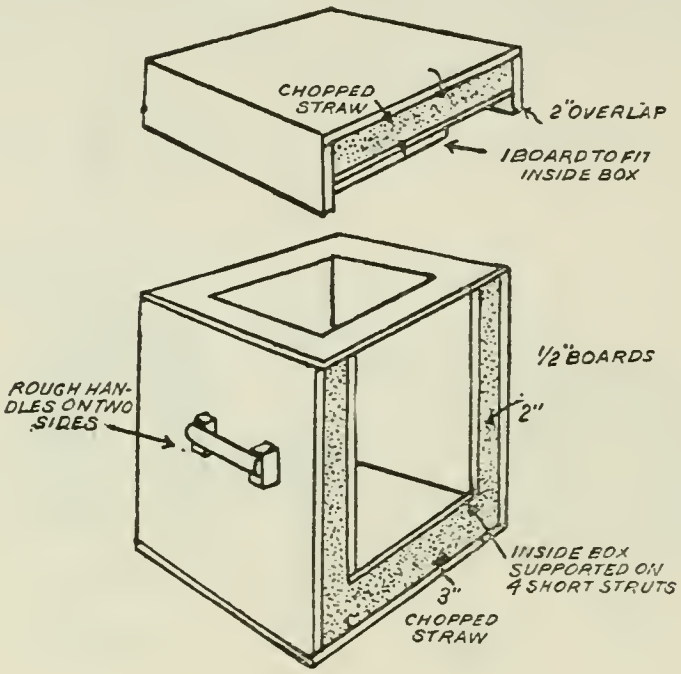


PLAN SHOWING SYSTEM OF TRENCHES

Fig. 36.

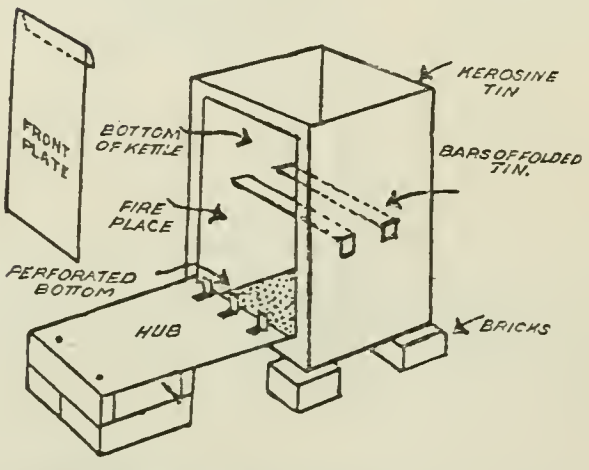
infection of clothing and bedding, thus enabling a man to have a satisfactory hot bath, turn in his outfit for disinfection, receive a fresh clean outfit, and return to his billet. Similar establishments are to be seen at all large bases in France. These latter are mainly

utilized by men who are proceeding home on leave or returning from leave. At these institutions a man may get a steam or hot bath, have his outfit and outer clothing as well as blankets dis-



JACKETED HOT BOX
One end removed to show construction

FIG. 37.



RAPID WATER BOX

FIG. 38.

infected, leave his underclothing for washing and disinfection, receive a new outfit of clean underclothing, and have the services of a barber. Canteen facilities and sleeping accommodations are also

provided. A man is also enabled to turn in his blankets and other parts of his outfit not required while on leave and pick them up on his return. When any considerable number of men arrive from England and cannot be transported immediately to their destinations, they are quartered in rest camps which have bathing, disinfection and sleeping accommodations, the latter under canvas, the former in huts similar to those described above. Improvised shower baths are often seen in hospital camps or other permanent camps. One of these is shown in Fig. 40.

In spite of the undoubted tendency of the British soldier to bathe whenever possible, and of the very full provision of bathing

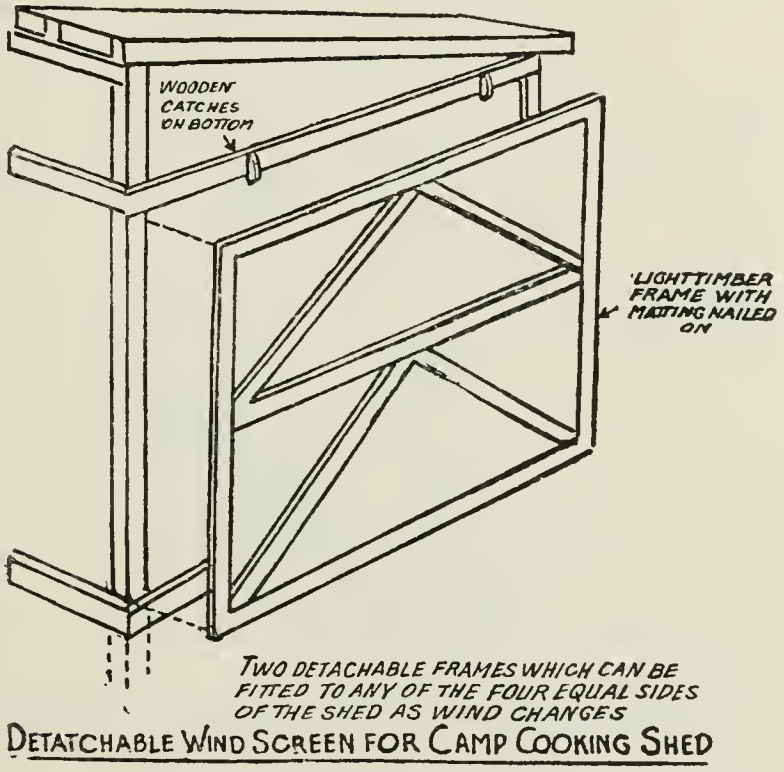
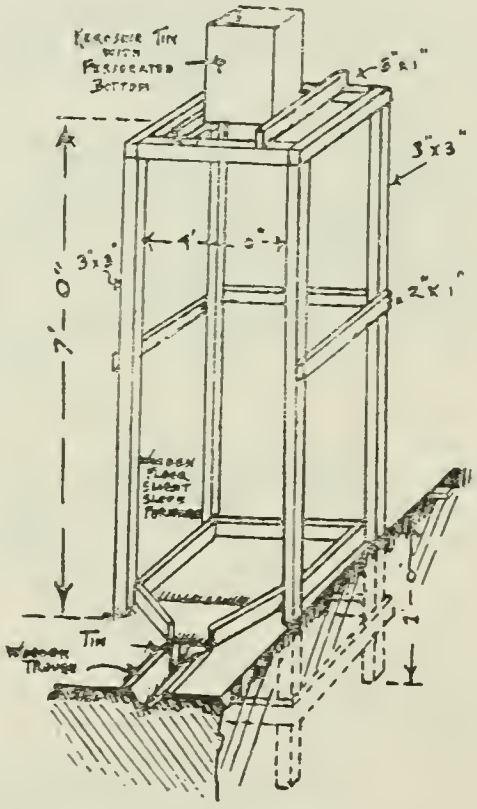

WOODEN CATCHES ON BOTTOM
LIGHT TIMBER FRAME WITH MATTING NAILED ON
TWO DETACHABLE FRAMES WHICH CAN BE FITTED TO ANY OF THE FOUR EQUAL SIDES OF THE SHED AS WIND CHANGES
DETATCHABLE WIND SCREEN FOR CAMP COOKING SHED

Fig. 39.

and washing facilities all over the area occupied by the Expeditionary Force in France, conditions in the trenches and overcrowded billets in the rear of the fighting line are such as to make it impossible for a man to avoid infestation with lice.

Apart from the personal discomfort suffered by the individual whose clothing is infested, there is the very important consideration of the prophylaxis of certain diseases to be considered in this connection. There are two distinct lines of attack; one is concerned with the sterilization of underclothing, uniforms and blankets at fixed intervals, as well as frequent bathing, and the other with the use of various substances designed to repress or destroy

the insect and its ova. In practice many of these substances prove disappointing, but others are undoubtedly deleterious to body lice and tend to keep them away from the body, although they have little or no action on ova. In this connection it may be stated that bedbugs are infrequently encountered among the troops and head lice rarely seen. In the smaller bathing establishments it is customary to have the uniforms overhauled while the men are taking their baths, particular attention being paid to trouser seams, which are systematically ironed out with hot flat irons. Of course in the



— Improvised Shower Bath —

Fig. 40.

larger establishments all uniform equipment can usually be passed through a disinfector and the ironing is omitted. In the trenches the most that can be done is to overhaul underclothing regularly and use either a powder or a paste, the former being sprinkled inside the clothes and the latter rubbed along the seams. The active principle of the powder is naphthalene, and of the paste or ointment, crude petroleum. Both of these preparations are fairly effective, and formulae for them and for a number of other preparations are given toward the end of this section. While naphthalene has a lower insecticide action than kerosene, guaiacol, iodoform

and anise preparations, it has a less unpleasant odor than the first three named and is much cheaper than anise. Naphthalene also has the advantage of being effective against moths, and it may be freely sprinkled into and upon clothing and blankets which are to be stored indefinitely. A more elegant preparation, also repellent to mosquitos and fleas, is made of powdered menthol (three to five grains) and zinc oxide (an ounce.) Ordinary plain vaseline acts as a deterrent to lice, and in practice it is customary to add about three grains of white precipitate to the ounce of vaseline. The dipping of underclothing in an emulsion of soap and phenol or cresol ½ per cent, lightly wringing out the excess of the solution and drying, has been practiced, and garments thus treated will repel the insect.

Formulae for Pediculocides

1. N. C. I. powder (for killing adult insects): Naphthalene, 96 parts; creosote, 2 parts; iodoform, 2 parts. Two-thirds of an ounce for each man weekly. This powder is slightly irritating to the skin.

2. Menthol, 5 grains; zinc oxide pulverized, ½ ounce.

3. "Vermicelli": Crude petroleum, 9; soft soap, 5; water, 1. One ounce weekly per man. This is smeared on all inner seams of the clothing every 4 to 7 days.

4. Ammoniated mercury, 50; magnesium silicate, 25; zinc oxide, 25.

5. Crude oil ointment: Crude oil, 4 ounces; soft paraffin, 2 pounds. The paraffin is melted and the oil added with stirring.

6. Articles of underclothing impregnated with naphthalene and sulphur, by dipping into a solution of these substances (1 per cent of each in gasoline), wringing out and drying, are repellent to lice. This is said to be effective and the garments not especially irritating to the skin. A similar formula developed by experiment and investigation at the University of Minnesota is as follows: Heliotropin, 1 dram; oleum theobromae (cocoa butter), 15 drams; benzine, sufficient to dissolve. About 55 square inches of underclothing are painted over with this solution and this treatment serves to repel lice for several days.

Sanitation in Barracks and Hospitals

The Field Service Regulations state, that when a force is likely to remain halted for a long time, huts (*i. e.*, barracks) may replace tents for quarters. As a consequence of the stationary or nearly stationary character of the warfare prevailing on the western front,

huts or barracks have come to be the chief kind of quarters used both for hospitals and for housing men in camps, not only along the base line and on the line of communications, but also in the rear of the fighting line where the temporary structure known as the Nisson hut is frequently seen. The primary cost of huts is greater than of tents, but tents exposed to all weather undergo deterioration and usually have to be replaced after the second winter. They are, moreover, less comfortable and in the heavy winds of winter are not infrequently blown down. A type of building used as a hospital ward is shown in Fig. 41. Nearly all these huts and hospitals average 20 feet broad and 60 feet long, which gives a superficial floor area of 1,200 square feet and a total cubic content of approximately 12,000 cubic feet. The proper number of men housed in each hut, therefore, is thirty, which gives 400 cubic feet per capita and 40 square feet of floor area per man. As this is not a too liberal allowance, it is essential that this number of men should not be exceeded except for short periods and under pressure of necessity, and it is important that the space available be used to the greatest advantage by insuring that beds are distributed at regular intervals along side walls and at equal distances in order to get proper separation of sleeping men. The noncommissioned officer in charge of a hut is held responsible that this arrangement is maintained at night and that ventilation openings are not closed.

As the cubic space per head in these huts is only about 400 cubic feet, special attention is paid to ventilation. If the impurity is not to rise above 0.2 parts of CO_2 per thousand, each individual in the hut will require 2,000 cubic feet of air per hour. This means that the air will have to be changed from seven to eight times per hour if the delivery of fresh air is to be adequate. While for ordinary buildings the ventilation openings are generally of such a size as to provide for each individual an inlet space of 24 square inches, for huts of this character, with a cubic capacity of only 400 cubic feet per capita, it is considered that the inlet and outlet space per individual should not be below 40 square inches. Provided measures are adopted to obtain thorough distribution of the incoming air and secure its delivery at the proper level, this allowance does not result in drafts, and with a little care works out well in practice.

The ventilation of huts is entirely natural, from open windows, louvred openings in the gable ends, roof ridge ventilators, and by spaces in the roof about the stove pipe. Nearly all windows in huts are constructed on the hopper principle, and this makes for

BRITISH RED CROSS HOSPITAL NETLEY
TEMPORARY BUILDING

NEW PATIENTS WARDS.

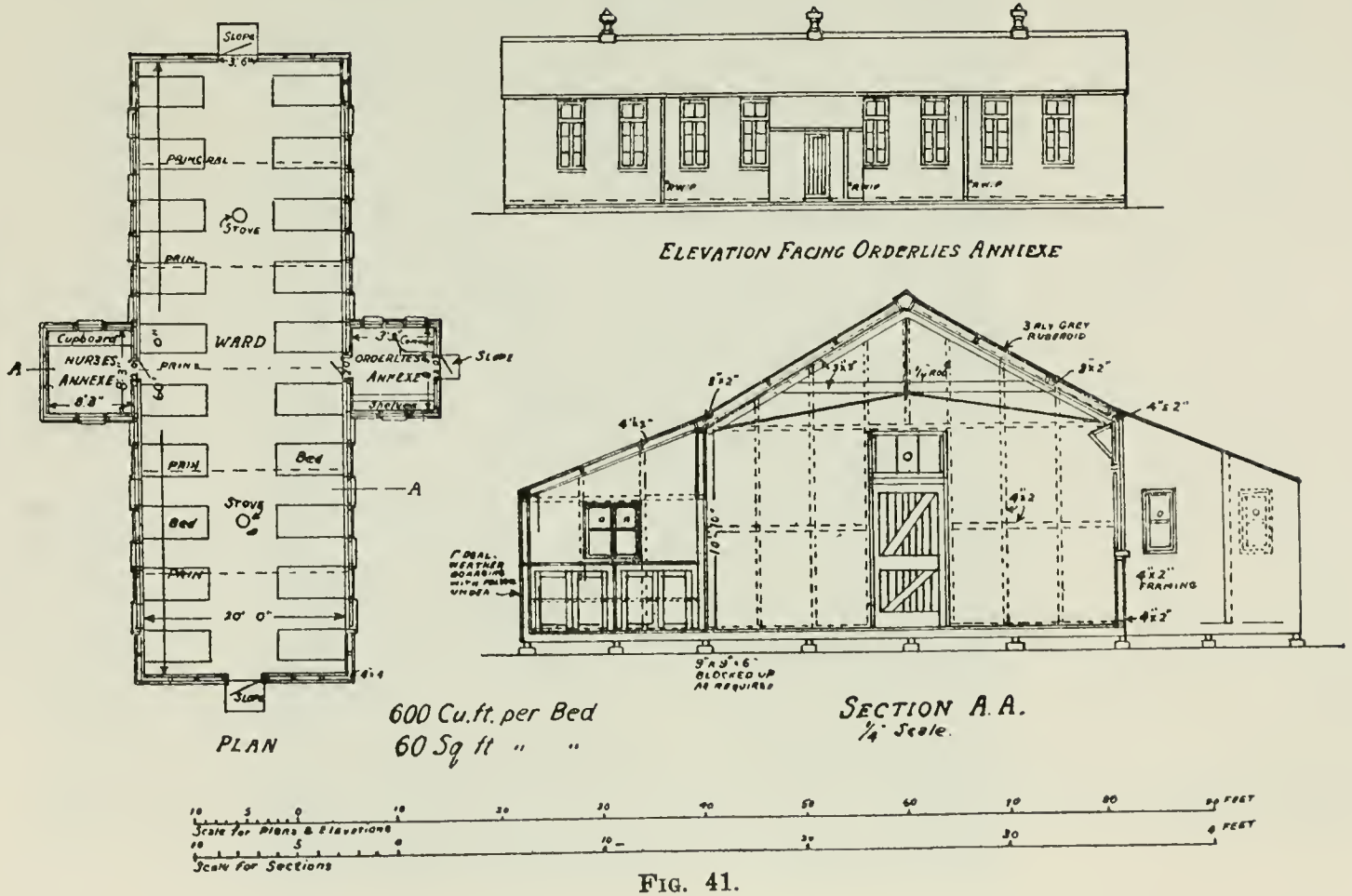


FIG. 41.

adequate ventilation (Fig. 42). The average hopper window, when open, provides an air space of 400 square inches. If the hut contains thirty men and each man has an air entry space of 40 square inches and air exit space of similar area, the total area for all openings will be 2,400 square inches. This is provided by opening the hoppers on six windows and, when properly disposed, three of these act as air inlets and three as air outlets. To keep the proper number of hopper windows open is a little difficult, but they can be fixed in position permanently by checks or kept open by adequate supervision. As a rule the best results are obtained when the three end windows on each side of the hut are opened, one series being diagonally opposite the other series. The amount of ventilation specified above is that which is required as a minimum in all seasons of the year; in summer all the windows are kept open to their full extent.

The louvred openings in the gable ends of huts are fixed and therefore difficult to put out of action unless clothing, etc., is stuffed into them. As a rule these provide from 200 to 400 square inches, according to the other means of ventilation provided. Ventilating spaces around stove pipes act as air extract shafts when fires are burning. Stoves are generally placed in the middle of the hut, and the movement of air is usually towards this situation from the open windows at the ends.

All varieties of construction have been used in huts, both in Great Britain and on the western front. As a rule, frame construction with inside sheathing or matched boarding is commonly seen with some form of patent roofing. Some huts are of a portable type, the so-called sectional buildings, easily assembled and placed in position and as easily knocked down and transported. Occasionally the walls of huts, hospitals and barracks are constructed of asbestos-cement composition rolled into sheets. This is made by mixing ground asbestos in the proportion of one to six with Portland cement and working it into a paste with water. It is rolled and trimmed into sheets and placed away for seasoning. This material is durable, resistant to climatic conditions, fireproof, and a non-conductor of heat, but has the disadvantage of breaking readily when struck by furniture, etc.

WATER SUPPLY

All the sources of water supply in a newly occupied area are carefully examined by members of the sanitary section. Preliminary to this examination, and until it can be made, it has been found

FIG. 42.—MESS ROOM, SHOWING HOPPER WINDOWS.

(To face page 174)

advisable to placard wells, springs, cisterns, etc., as "Dangerous." As soon as a water source is found to be free of metallic poisons or gross pollution the "Dangerous" notice is removed and replaced by one stating that the water is usable after chlorination. Full directions appear in the notice giving the amount of chlorinated lime (2 grams) required to a unit quantity of water, usually 110 gallons, which is the capacity of the water cart. Chlorination is quite universal in this area, as few waters are considered safe without it. Occasionally a preliminary treatment with a precipitant is necessary, or the water may be pumped into the water cart through the service filter, which acts not only as a filtering agent but also as a clarifying one, as it contains potash alum for precipitation. This filter, however, is infrequently used, although it is effective but slow in action and rather bulky for carrying on the water cart. Five grains of potash alum and one and one-half grains of sodium carbonate to a gallon of water, or a heaping tablespoonful of alum to 100 gallons of water, are the amounts needed for clarification.

Chlorinated lime is supplied in one-quarter pound tins, with a standard measure or scoop in each tin. After once being opened a tin is used for three or four days only, and any remaining chemical is then rejected as probably inert. The amount of chemical required for effective chlorination is determined in advance by testing the water, and this amount is then indicated on the placard posted at the source of supply. It is the duty of the Sanitary Section to plot each water supply on the map, giving the character of the water, its quantity, the depths of wells and other data. The Sanitary Section makes a complete water survey of the area with the necessary recommendations to improve the supply as well as its immediate surroundings, such as providing covers for well openings, copings, pumps, windlasses with ropes and buckets, where they are required. These data are assembled at headquarters and enable the engineers to carry out all necessary improvements and eventually lead to the establishment of various water-points throughout the area, to which the water is piped for distribution and stored in tanks. The tanks are usually in pairs, used and chlorinated alternately, the water bottles and carts being filled from the tanks. A special detail from the Sanitary Section is placed at the water source to see that the "water detail" conducts the chlorination process satisfactorily, and he keeps a record of all water carts supplied, their condition at the time, etc.

Should it ever become necessary to chlorinate water in small

quantities as in an individual water bottle (capacity 1,000 c.c.), a solution of chlorinated lime, 2 grams to a pint of water, is prepared. Three drops of this solution to each bottle will serve to sterilize the contents after standing for half an hour. If a dropper is not available, the drops may be delivered into the bottle with a butcher's skewer or a clean stick whittled to the size of a skewer.

To many individuals a small excess of chlorine in the water is quite unpleasant, and in order to avoid arousing a dislike of water so treated it is necessary that the chlorination be carefully performed. Unfortunately chlorinated water makes poor tea. Any excess of chlorine soon disappears if the water is allowed to stand a sufficient time before using. This is facilitated by having the main water-tank supply arranged in pairs.

Bacteriological examinaton of water supplies is carried out in the mobile bacteriological laboratories, which have been of immense value in this connection. At all the large bases have been established laboratories which are charged with chemical analyses, the testing of food supplies, water, disinfectants, etc. The personnel of these laboratories is largely made up of appointees from civil life, many of them sanitary engineers. chemists and public health medical officers. Small test cases are supplied to sanitary medical officers for testing waters to establish the amount of chlorinated lime necessary to produce sterilization.

My indebtedness to Lieut. Col. S. Monckton Copeman, R. A. M. C. (T), of the Hygiene Department of the Royal Army Medical College, and to Lieut. Col. W. J. L. Lyster, M. C., U. S. A., who kindly furnished me with the diagrams of the sanitary devices which appear in the text of this paper, as well as to the members of the sanitary sections who originated and reproduced them, is gratefully acknowledged.

I am also under obligations to the authors of the articles named in the "References," from whom I have drawn fully whenever, by so doing, I judged that a clearer exposition of the subject under consideration could be made.

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NAVAL TRANSPORTATION OF ARMY SICK AND WOUNDED OVERSEAS[1]

By Captain J. A. MURPHY
Medical Corps, United States Navy

IN PREVIOUS wars, and for a time in the present war, transportation overseas of the sick and wounded of both armies and navies has been accomplished chiefly by utilizing ships specially fitted for the purpose. These vessels, designated as hospital ships or ambulance ships, have been developed in almost every instance from the passenger type of carrier, structural alterations being usually made to provide facilities for the care, in transit, of certain types of cases usually classed as medical, surgical and infectious. The term "hospital ship" has gradually come to mean a vessel upon which every facility for *prolonged* treatment of patients would be available, in all respects similar to a shore hospital. The term "ambulance ship" has come to mean a vessel having its interior arrangements devoted almost exclusively to the *temporary* comfort of patients in transit, so that relatively large numbers can be transported, provided there is more or less restriction of the type of cases suitable for transportation.

For army purposes the hospital ship would be of best service at coastal points of disembarkation or embarkation until receiving or evacuation hospitals become established on shore. Hospital ships are a necessary part of a navy, particularly as the units of a fleet, both in peace and war, invariably assemble at points usually far distant from shore hospital facilities. Fleet movements involving change of base from time to time make it impossible to anticipate hospital needs at home bases, and hospital ships if present can carry the overload and, when necessary, distribute excess patients to other bases.

For armies operating beyond seas, transportation facilities of the ambulance ship variety are essential, and during the present war the evacuation of sick and wounded has been chiefly accomplished in this way.

The great problem of bringing home the sick and wounded, aside from the psychological necessity of returning the disabled to their homes, has been an ever-present factor to every one of the allied

[1] Read at the twenty-sixth annual meeting of the Association of Military Surgeons, Camp Greenleaf, Ga., October 14, 1918.

countries in this war. The concentration of war effort in France, together with the thousands of casualties, has accentuated the problem, there being relative and actual restrictions to a great degree of the number of beds available in that country. The same result has followed certain shore activities elsewhere, due to climate and to the limited resources of the area involved, more than to certain factors such as loss of towns by invasion and increased population consequent on militiary activities, all acting to reduce housing accommodations in the active war areas.

The use of hospital and ambulance ships contemplated their immunity from the combatant sea risks of war, but gradually as a result of the enemy's application of the submarine (its only effective naval weapon in this war), it has come to pass that the safety of these vessels can no longer be considered as guaranteed without convoy. As it may not be advisable from the military point of view to convoy one ship, a hospital or ambulance ship, because it cannot be designated as such without localizing the other vessels in the convoy, becomes to all intents and purposes one of the several vessels, cargo or transport, and is equally liable to be torpedoed as a result of the enemy's war on all shipping.

The question of the advisability of assigning bottoms exclusively for army ambulance ships becomes a matter of consequence from a military standpoint. The policy adopted will be based on the loss or gain in shipping as the submarine gains or loses in the effort made to elminate the sea communications of the allied armies operating in France and elsewhere. Inability to provide sufficient hospital beds for thousands of casualties in the shore war zones and consequent resulting interference with operations at the front lines would ultimately influence the policy determined upon, owing to the need for evacuation. To sustain the morale of the fighting forces, the care and evacuation of the sick and wounded undoubtedly should always be recognized as an essential equal in weight to the supply of men, ammunition and food. The decision as to policy will, therefore, most probably be based on the number of ships, and on the number of men who can be kept in contact with the enemy, keeping in view all the essentials that will tend to make the available force in every way efficient and, if possible, superior to the enemy forces.

When in April, 1917, the United States declared war against Germany, only one navy hospital ship of small capacity was in commission. Two additional ships have been added to the fleet and

one vessel is under construction, the latter designed from its birth as a hospital ship. For the reasons already stated in connection with the needs of a navy, these vessels may be considered unavailable, except in emergency, for the transportation of army sick and wounded.

As the war progressed, it became necessary to place the Navy in control of all United States vessels engaged in transportation of troops and supplies. Prior to the turning over of such shipping to the navy personnel, provision was made to install navy standard accommodations for the sick, with due regard to expected casualties from the personnel of the crew and from the troops in transit to the war zone. As it became evident that transports would be utilized for the return of army sick and wounded, accommodations were increased, so that these vessels now have from 50 to 175 sick bay beds for serious medical and surgical cases.

The sick bay of a naval transport is usually located in the after part of the superstructure of the ship, so that natural light and ventilation are available. In general this space comprises a 30 to 70 bed ward compartment, a fully equipped operating room, dispensary, dentist's room, examining room, pus operating room, in some cases an X-ray room, a venereal prophylaxis room, a compartment containing a large disinfector, a store room for 3 to 6 months' supplies, a diet kitchen, toilets and baths, and apart from the large ward a three-compartment isolation ward, to provide for isolation in more than one communicable disease. On many ships the staterooms of officers can be utilized for bed-ridden or helpless cases, but owing to the separation of patients in small spaces this requires a large attendant personnel.

In some cases, troop spaces are also available for thousands of patients who in a measure need no attention. In visualizing naval transports as carriers of sick and wounded, the uninitiated, and even those who have been on the high seas in comfort merely as passengers, must bear in mind that war conditions have added to the discomfort of warm weather, bad weather, rough seas and congested compartments.

Screened lights quite often necessitate the closing of ventilating openings so that interiors become stuffy and uncomfortable, particularly so when the normal interior heat of the vessel is increased by warm weather. Few ships are entirely steady, and to the acutely ill, especially in certain types of surgical cases, ship motion is a source of much discomfort, a factor not to be overlooked by the

army medical officer in charge of embarkation at the coastal evacuation hospital, when contemplating the transfer of cases to relieve overcrowding and to make room for the flow of new cases from the interior.

Under present conditions, so far as naval vessels are concerned, naval medical personnel (consisting of from three to six doctors, one dentist, and many hospital corps men, equipment and supplies are provided for the care of army sick in transit east and west.

The sick among eastbound troops as a rule consist invariably of cases of communicable disease, with an occasional acute surgical case. Winter conditions increase communicable diseases of the respiratory type, pneumonic complications appearing all too frequently. Inspection of the personnel is provided for at cantonments and at ports of embarkation; if not rigidly carried out, more infectious cases result than there are available beds, involving also the infection of the crew and ship and the expeditionary forces already in France.

Provision is made for the arrival, in advance of the main detail of troops, of a sanitary squad of the troop contingent with the object of acquainting these officers and men with the sanitary regulations of the vessel, the location of toilet facilities, and the general arrangements of the troop spaces. These officers and men quickly transmit the information gained to the main body upon arrival, and aid afterwards in maintaining the cleanliness and habitability of the troop areas. This provision is most requisite in view of the fact that many are boarding ships for the first time.

The army medical personnel is charged with making the necessary sanitary inspections of the army personnel and of the troop spaces and with holding sick call for troops.

The senior naval medical officer is responsible for the general sanitation of the ship and, if necessary, may inspect all persons on board to determine the existence of disease or the lack of protective vaccination against typhoid and smallpox. He is also responsible for the care and treatment of all patients, who, ashore, would be considered hospital cases and, because they cannot receive necessary attention at army sick call, are transferred to the sick bay. He provides a sick call for all casuals or passengers not in transit as part of an organization and for organized units of the Army when no army medical officer is provided.

Army nurses are subject to call for duty under the senior naval medical officer if their services are required. Card records are kept

by naval medical officers of all army patients on both the army and navy forms. Navy medical history sheets are also kept to be filed in the Bureau of Medicine and Surgery for future reference.

The disembarkation and embarkation of patients from and to naval transports is the special duty of the army surgeon of the port of embarkation.

Westbound or returning patients are of a different type from those cared for on outward or eastbound trips. All acute cases and those deemed fit to return to the front within six months are retained in France. Individuals permanently disabled not requiring active treatment, mental cases, those permanently unfit for duty, and tuberculous patients are returnable. These cases may be classed as to care: totally bedridden (nursing required); those able to walk but requiring surgical dressing; those able to walk requiring no special attention; mental cases requiring a guard; and cases requiring isolation.

The average surplus capacity of the transports, reserving beds for navy patients, runs about as follows: Bed cases, 40 beds for the old vessels; 90 beds for the new vessels. Surgical cases able to walk but requiring dressing, 200 beds (standees), old vessels; 100 beds (standees), new vessels. Insane (acute), 5 beds, old vessels; 25 beds, new vessels. Able to walk in officers' rooms, 25 beds. Able to walk (troop standees) 2,000 beds.

It has been estimated by the Surgeon General's Office, U. S. Army, that of the total personnel in France 7 per cent will be returned to the United States each year, and of this number 50 per cent will be bed cases. This means that for 5,000,000 men about 30,000 beds will be required each month, 15,000 of these being for helpless cases. The latter deserve *en route* every comfort and care and a reasonable chance for safety in event that the vessel is torpedoed and it becomes necessary to abandon ship.

Navy experience in the past and under present war conditions at sea indicates the inadvisability of adopting well-meant suggestions, such as placing large numbers of insane on one vessel, or of crowding tuberculous patients into quarters not easily disinfected before healthy troops are assigned to these spaces on their way to France; or of placing in the troop spaces below decks, under adverse conditions, helpless sick of any type. To those who can visualize the conditions of "abandon ship," the difficulty of handling any large number of insane at such a time and afterwards, particularly in the boats and on rafts, is something of

moment. To make conditions as favorable as possible for these unfortunate beings, the isolation wards, not ordinarily required on westward trips, are utilized because of their situation and the available toilet facilities. Tuberculous cases are placed, whenever possible, in spaces where sunlight and natural ventilation are abundant.

The troop spaces can be utilized for cases able to walk, but are not prepared with toilet facilities, messing arrangements, easy access and free ventilation for transporting hospital cases requiring nursing.

A careful survey of the entire situation indicates that, despite the apparently restricted accommodations on each transport, the multiplicity of these vessels and frequent sailings create an aggregate of beds sufficient in due course to take care of this problem, keeping in view the interest of the disabled men who have given enough to merit every consideration, and provided evacuation is conducted with system and forethought.

The proper transportation of sick and wounded from France is contingent on due preparation there in the way of hospital facilities so that even in times of activity at the front it will not be necessary to hasten unduly the transportation of a patient. No patient should be transferred to a ship until active treatment is no longer required. Fracture cases requiring special extension of any kind are not suitable for ship transportation on the high seas because of the motion of the vessel. Amputation cases with large open areas actively infected should be retained on shore. Many surgical cases suffer great pain in transit due to movement of the vessel imparted to the injured parts. Medical patients, acutely ill, or who are apt to die en route, should be retained.

Coastal evacuation hospital facilities should be ample, so that cases arriving from the interior on hospital trains can be accommodated until a convenient time for transfer to the ship is presented. Lack of evacuation hospital facilities often will necessitate immediate embarkation, possibly during disembarkation of equipment, stores, troops, and the convalescent sick developed in transit, while at the same time coaling for the return trip. Some thought should be given the depressing psychological effect on newly arrived disembarking troops of viewing maimed men returning from the front. Hasty embarkation under the above conditions prevents the medical department of the vessel from cleaning up and otherwise preparing for the reception of new patients, and it increases

unnecessarily the period of time the patient must reside within a ship's environment, at best a makeshift for what can be better accomplished ashore.

Hospital facilities on shore should be ample to care for an excess of patients over the transport accommodations for a given time. In periods of activity at the front there will be an overload which will be provided for by excess transport facilities in times of inactivity. The utilization of normal capacity at all times will conserve space, a task made necessary by the relative shortage of ships. Excess of ship facilities will in times of inactivity waste space.

Deficient shore facilities will lead to overcrowding on the ships with difficulty in providing the necessary care and attention for the sick and wounded. Failure to distribute properly the sick and wounded leads to the return of ships without patients. With shortage of beds at the port of embarkation there is a temptation to evacuate unfit cases and excess numbers. Overcrowding results in discomfort and inability to provide proper facilities under sea conditions, which sooner or later lead to complaints and criticism. Under all but the best of sea conditions, and even with but few helpless patients, it must be borne in mind that it will always be quite a problem to save helpless patients at "abandon ship," an ever-present possibility.

On this side, at the home port, a steady uniform flow of sick can be efficiently provided for, but not so if this flow is subject to great accessions for long or short periods, as will be the case if beds are not ample in number in France.

The above is a brief outline of a rather extensive subject which has come to be an important concern to the Surgeon General of the Navy. He has given much thought to this subject, both in anticipation of the time of the taking over of the German ships interned in the United States when it was considered that only the casual sick among troops in transit to France would have to be provided for; and subsequently when the extent of navy participation in the great problem of returning army sick and wounded from abroad unexpectedly became one of his many responsibilities. In the hurry of altering vessels to adapt them to a new service, naval medical officers of experience were selected to coöperate and advise with the naval constructors in obtaining as far as possible ideal arrangements for the treatment and comfort of the sick, and at the same time provide for proper sanitary arrangements for

the healthy troops. Newly enrolled medical personnel, after a progressive scheme of training at naval hospitals, naval stations, and on board active ships of the regular Navy under experienced naval medical officers, soon acquired a knowledge of naval life, customs, and duties which, together with their professional knowledge and a most gratifying *esprit de corps*, fitted them quickly to take their place in the existing Navy Medical Department. The hospital corps men, the nurses of our combatant ships, likewise came from a varied civil status and by a similar process of intensive training filled most efficiently the thousands of places created by the great expansion of the Navy. Hospital equipment and supplies were rapidly assembled, and from the first beginning of troop transportation by the Navy it is very pleasing to relate that every ship was essentially ready when placed in commission.

Changes for betterment in the old, and constant accessions of new, transports make it necessary for the Surgeon General to be always ready to act toward the continuance of tried measures and to foresee and prepare for the adoption of new arrangements to meet an ever-changing situation. A system of supervision and inspection has been instituted at the principal embarkation ports in the United States and France. Medical officers of long experience and of actual experience on the larger transports have been detailed for this very important duty as aides to the admirals in command of the various activities of the transport service. Medical officers are being constantly trained to act as senior medical officers of the new transports now under construction, others in turn will fill their places, all with a view to continued efficiency.

In closing it is only proper to say that reports indicate that the sick and wounded of troops appreciate the effort to make their short stay under the care of the Navy as comfortable as may be under war conditions on a ship at sea.

It is also deemed fitting to mention here the loyal service so far rendered by the naval surgeons, dentists, and hospital corpsmen, most of whom were in civil life but a short time ago. They have uncomplainingly gone on with their duties despite discomforts and special war perils, and they willingly labor day and night to make the condition of their patients easier and better on the way to the home country.

NOTES ON THE MEDICAL DEPARTMENT OF THE CUBAN ARMY AND NAVY AND ITS REORGANIZATION

By Colonel V. HAVARD

United States Army (Ret.)

DURING the last few years the strength of the Army, as established by law, was normally 17,000, but owing to the difficulty of enlisting suitable men and other reasons, this number had fallen to an average of 12,000 officers and men during the fiscal year 1917-1918. Under the new or obligatory service law, approved by the President, August 3, 1918, the Army is to consist, as before, of 17,000 men and of as many officers as may be necessary for their organization in active service. The military service is obligatory for all men from 21 to 28 years found physically fit and not otherwise exempted. The period of service is two years. This law is to be in operation only during the present war and for one year after peace has been signed. Military instruction, however, will remain compulsory for all young men between 19 and 25 years old, except those exempted from military service. For all students in the university and state schools, the period of instruction is reduced to two years. In all schools and colleges, public and private, gymnastic exercises suitable as preparation to military service will be required of all boys who have passed their tenth year.

The Rural Guard (*Orden Publico*), 6,300 strong, constitutes an important part of the Army. In peace time it is exclusively on police duty, but in case of war or serious internal disturbance it may be called to perform military service. It is partly recruited from volunteers between 22 and 40 years, especially those who have a good record of previous service.

The Navy consists of 1,100 men and of as many officers as may be necessary.

The general staff of the Army is divided into two departments, direction and administration. Each department is divided into sections and each section into branches or bureaus (*negociados*). The Chief of Staff, as well as his *"auxiliares,"* the Chief of Direction and the Chief of Administration (*auxiliares del Jefe de Estado Mayor*), are appointed by the President from among officers with rank of colonel. Like all other officers on staff duty, they are appointed for a period of four years and cannot be reappointed except

after an interval of two years on duty with their branch or arm of the service. The chief of staff, while serving as such, is given the rank and pay of major general, and his two *auxiliares* the rank and pay of brigadier general. The chiefs of section receive no increase of rank but are granted an extra allowance of pay, varying according to rank; thus the chief of the medical section, who is a lieutenant colonel, receives an extra monthly allowance of fifty dollars.

The Island of Cuba is divided into nine military districts, each under the command of a colonel and garrisoned by a force of infantry, cavalry (including rural guard) and, where needed, artillery. Of these districts, two are near the city of Havana, namely, that of Camp Columbia forming the largest military post on the island, and that of La Cabaña across the bay.

The unit of organization is the battalion in the infantry and cavalry, and the squadron in the rural guard. The infantry consists of 6 battalions, each 560 strong (officers excluded) and divided into 4 companies. The cavalry consists of 7 battalions, each 300 strong (officers excluded) and divided into 3 troops. The rural guard consists of 42 squadrons, each 150 strong. In addition, should be mentioned: 16 platoons machine guns; 3 batteries coast artillery, each of 4 companies; 1 light battery; 2 mountain batteries, 1 company of engineers; 1 company of signal corps.

One of the great difficulties in the way of giving efficient medical attendance to the troops lies in their dispersion into small detachments all over the island. Outside of the posts at the headquarters of the 9 districts into which the island is divided, all other posts are small. Thus the rural guard, consisting of 6,300 men, garrisons 402 stations, so that many of these are only occupied by a few men. It is evident that several such stations must be attended by the same medical officer, or else that the patients should be sent to the headquarters of the squadron or wherever the nearest medical officer is to be found.

Through the Department of Direction, the chief of staff directs the organization, instruction and discipline of the Army. It is divided into seven sections. One of these is the Section de Sanidad, or Medical Section (Medical Department). This section is divided into two branches or *negociados:* (1) medicine and surgery; (2) veterinary.

The medical corps should consist, under the present law, of 2 lieutenant colonels, 3 majors, 14 captains, 21 first lieutenants, and 2 pharmacists with rank of first lieutenant—in all 42 medical officers.

Owing to the difficulty of securing suitable candidates for the Medical Corps, the actual number of majors is only 2, and that of first lieutenants 14, making a total of 34. Of the 2 lieutenant colonels one is chief of the medical section on the general staff.

A proportion of 4 medical officers per 1,000 men is admittedly the minimum deemed necessary in all properly organized armies. Such minimum would be insufficient in time of war, but the resources of the Red Cross could then be depended upon to supply the deficiency. In time of peace, the rate of 4 per 1,000, in view of the dispersion of the Army in numerous small detachments, is the lowest possible that can secure a reasonably efficient medical service.

At the present time, with an army of only 12,000 men, the rate is less than 3 per 1,000. Owing to the lack of military hospitals, many patients (at least one-third) have to be sent to the nearest civil hospital where, on account of the shortage of medical officers, they are often left entirely to the care of civilian physicians. The treatment of soldiers in civil hospitals, generally crowded and poorly equipped, where they are cut off from effectual military supervision, is distinctly detrimental to the best interests of the service. This evil, of course, can only be remedied by a greater number of military hospitals and a larger corps of medical officers.

On the basis of 4 per 1,000, for an army of 17,000 men, the medical corps should consist of 68 medical officers.

A board of officers convened by the chief of staff, consisting of Col. V. Havard, U. S. A. (Ret.), two medical officers of the Army, one from the Navy, and two line officers, met on September 17, 1918, to prepare and recommend a scheme of reorganization for the Medical Department of the Army and Navy. This board, having completed its work, adjourned on September 25 and forwarded its proceedings to the Secretary of War and Navy on the 27th.

The recommendations of this board are, in my opinion, the best possible at this time. They aim at making the Medical Department efficient with as few changes as possible in existing laws, and therefore with but little new legislation.

One of the most important of these recommendations is to raise the Medical Department from the status of a "section" to that of a "department," so that the General Staff would be divided into three departments—direction, administration, and *sanidad*. This is deemed necessary on account of the very important duties and responsibilities of the Medical Department, and because these duties cannot be efficiently performed without a large measure of auton-

omy. It is proposed that in all that relates to professional and technical matters, medical officers will correspond directly with their chief, and the latter directly with the chief of staff, thus insuring more expeditious and efficient results.

A section, known as "Medical Supply Section," is created in the Department of Administration, to be in charge of a medical officer assisted by a veterinarian and a pharmacist. This section will procure and distribute medical supplies, a duty now performed by non-professional officers.

The medical chief (*Jefe de Sanidad*) will be selected from the two colonels and have the grade and emoluments of brigadier general. His term of office is normally four years, as in the case of other staff officers, but may be extended at the will of the President. His title, under his signature (in conformity with that of the chiefs of the other departments) will be: A. B. C. Auxiliar del Jefe de Estado Mayor General, Jefe del Departamento de Sanidad. (Auxiliary to the Chief of the General Staff, Chief of the Medical Department.)

No military rank is used in connection with the signature of chiefs of departments in the Army or chiefs of sections in the Navy.

Under existing laws, the number of medical officers in the upper grades is so few that promotion is very slow, and first lieutenants of several years' service see no prospect of advancement to a captaincy in the near future. The practice of medicine in Cuba is so lucrative that the young medical graduates of the high type wanted for the military service are not attracted by the pay and rank offered them, and prefer to engage in civil practice, where a minimum income of 300 or 400 dollars a month can generally be secured from the beginning. It is, therefore, found necessary, if the Medical Corps is to be filled up, to offer higher rank and quicker promotion.

With this end in view, the board has recommended that the medical corps—for an army of 17,000 men—shall consist of 2 colonels, 3 lieutenant colonels, 9 majors, 24 captains, 29 first lieutenants; a total of 67. To this should be added 3 pharmacists, one with the rank of captain, and two with rank of first lieutenant.

It is also recommended that the lieutenants and captains shall receive $25 a month in addition to the regular pay of their grade.

A medical school is to be established in the Columbia General Hospital for the special instruction (professional and military) of candidates for the Medical Corps. Admission is obtained after examination, and the course must last not less than six months.

After satisfactory final examination, the candidates are to be appointed with rank of first lieutenant in the Medical Corps.

The system of promotion, in all arms of the service, is by seniority and selection, as follows; Of each three vacancies in the grade of captain, two are filled by seniority and one by selection. Of each two vacancies in the grade of major, one is filled by seniority and one by selection. Of each four vacancies in the grade of lieutenant colonel, three are filled by selection and one by seniority. Vacancies in the grade of colonel are all filled by selection.

The added requirement recommended for the Medical Corps is that medical officers of the ranks of lieutenant and captain shall first stand a physical and professional examination to show their fitness for promotion.

A dental corps to consist of 11 dentists, appointed after examination, is recommended—2 with rank of captain for the general hospitals, and 9 with rank of first lieutenant, or one for each military district. Each dentist is supplied with an orderly.

A nurse corps is also to be organized for the general hospitals as soon as suitable quarters can be provided for it.

The board recommends the establishment of two general hospitals, one at Camp Columbia (near Havana) and the other at Santiago de Cuba. The former, laid out in a provisional manner during the first American intervention, is being rebuilt on a liberal and well-thought-out plan, and should be completed within a couple of years. It is on a beautiful site and promises to compare favorably with any similar institution in America. The hospital in Santiago de Cuba has not yet been started; meanwhile, military patients are crowded in one or two wards of the civil hospital.

In addition to these two general hospitals, six district hospitals are proposed, namely, one at the headquarters of each district from which neither of the general hospitals is readily accessible, and infirmaries at the headquarters of battalions and wherever the exigencies of the service require. The district hospitals now in use, with one or two exceptions, are inadequate, needing additional room and many repairs and improvements.

In accordance with general experience, the rate for sanitary troops in an army should not be less than 4 per cent. and is generally more. Under existing regulations this rate is less than 2 per cent in the Cuban Army, including orderlies (*asistentes*), each officer being entitled to at least one orderly. The noncommissioned officers consist of sergeants 1st, 2nd, and 3d classes. The board recommends that the rate be increased to 4 per cent and the corps

composed as follows (for 17,000 men): Sergeants, 1st class, 16; sergeants, 2nd class, 40; sergeants 3rd class, 44; privates, 436; orderlies, 81; a total of 617. To this should be added the 3 orderlies of pharmacists and the 11 of dentists.

All these men are to be instructed in their various duties in a special school organized in each of the general hospitals. The school of the Columbia General Hospital has already been in operation for several months with excellent results. To facilitate this instruction the "Drill Regulations and Service Manual, U. S. Army" has been translated into Spanish and, it is hoped, will soon be printed and made available.

VETERINARY CORPS

The Veterinary Corps is to be a section of the Medical Department. The number of animals under its care is estimated to be at least 10,000, which, like the men, are much scattered over the island.

It is to consist of 34 veterinarians, as follows: 3 with rank of major, 10 with rank of captain and 21 with rank of first lieutenant. Their uniform is the same as that of medical officers, with the exception of the special insignia (serpent and cup instead of caduceus), and they are to receive, for equal rank, the same pay and allowances.

The general veterinary hospital already established and doing excellent work at Camp Columbia will be maintained and enlarged. In this hospital is to be instituted a school for the special instruction of veterinarian candidates, the students receiving their appointment after a course of six months and successful examination. Another school for the special instruction of the enlisted personnel is already in successful operation.

NAVY

The Secretary of War is also Secretary of the Navy, his title being Secretary of War and Navy.

The navy of Cuba consists of 2 small cruisers, 1 school ship, 1 supply ship, and about 20 gunboats, torpedo-boats, destroyers, etc. Its personnel, as allowed by law, is 1,100 men and as many officers as necessary. An academy for the instruction of cadets has been establishel at Mariel. An appropriation has also been made, and plans drawn, for a general hospital on the shore of Havana Bay. The reorganization board has recommended that, in addition to this hospital, three dispensaries be established, one in Santiago de Cuba, one in Cienfuegos and one in Cardenas.

An important recommendation is that the Medical Department of the Navy, now a mere *negociado* (branch or bureau), be raised to the status of a section, and its chief transact his business directly with the chief of staff.

The medical corps, now very inadequate, consists of a chief and 4 assistants. The board deems necessary that it be increased to 10 medical officers now and to 16 when the general hospital is ready for occupancy. Of these medical officers, 2 will have the rank of *medico de corbeta* (major), 6 that of *medico primero* (captain) and 8 that of *medico segundo* (first lieutenant). One of the *medicos de corbeta* (corvette surgeons) will be appointed chief of the section, and sign as follows: A. B. C. Corvette Surgeon, Chief of the Medical Section.

While on duty as chief, he will receive the pay and allowances of the next higher grade.

The Medical Corps will also include 2 pharmacists and 2 dentists, all with rank of first lieutenant.

It is recommended that, as in the Army, the medical officers of the assimilated ranks of captain and lieutenant be granted a monthly increase of pay of $25.

In the general hospital, a school is to be organized for the special instruction of candidates for the Medical Corps, and another for the instruction of the sanitary corps men.

EDITORIAL

THEODORE ROOSEVELT

To us, of the profession, who stand so constantly at the portals of exit and entrance of life, these processes must of necessity seem more natural than to our brothers of the laity. Yet I think it has occurred to all of us that death comes less as a shock in certain circumstances than in others. To close tired eyes on a pain-racked existence does not give the same impression as the stilling of vital functions in one who has seemed the embodiment of living force.

And so it seems to us that the death of Theodore Roosevelt meant more than just the death of a man and a citizen of the Republic. He was in every sense the antithesis of death—the exponent of life and forcefulness and all the joy of work and living. It is hard for those who know him to think that he has gone from the world of today beyond the silent river and from this time is to be to us merely a cherished memory, a salient figure in the history of the land to which he gave his life, his devotion and the best effort of a remarkable personality.

As any man in public life, there were those who disapproved his actions in part, but even those who did not hold with him in his policies had naught but admiration for the man himself. Irrespective of the party which he led, he was easily the greatest democrat we had. His democracy was of the finest sort and one which, while it did not lend itself to the grotesquer side, left him approachable to any man of any station who had a message to deliver to him or a truth to tell. And it was a kindly and understanding democracy, tempered in spite of brusque speech and honest frankness with the fine character of the true gentleman, of the sympathetic soul who saw, with the clear eyes behind those heavy lenses, the clean things of life and would not look on those which were not.

To appraise him as a public character is a task which is better left to historians of a remoter time, for, as the years add to his distinction, the things he did for the country he governed will probably be more clearly understood.

For those who were fortunate in knowing him as a personal friend it is difficult to write an adequate appreciation. His character was so many-sided that one wondered so many fine and lovable traits could be contained in one soul. He was loyal to his friends beyond a question; he was patient with those who transgressed, with a gentleness which seemed at times at variance with the

ruggedness of his nature. He was as merry as a boy when in lighter mood, and serious and stern when occasion demanded. In a measure, his was a simple mind, and he delighted in the incidents of life which brought with them a measure of fun and which appealed to his sense of humor.

To those who had the privilege of knowing him in his intimate moods, it was a keen pleasure to realize this happy trait in his nature—the readiness with which he could shift the cares which demanded thought and decision and judgment and turn buoyantly to the lighter side of affairs.

To those who knew him, the sun-swept cleanness of his mind and personality was a constant joy and an inspiration. Nothing prurient nor low could live in his presence. With him thought and expression must have at least a decent basis. Blunt and basic and out of hand expression might be, but the underlying touch must be that which made for a clean and manly tone. In his regiment. the "Rough Riders," he presided over the headquarters mess, and though men often damned in unequivocal terms the coldness of the coffee, or the slackness of the service, there was never a story told which might not have been related in mixed company. Somehow. when he was there, no one had the inclination.

If a man can so shape and direct, unconsciously, the thoughts and feelings of those with whom he is associated, it should be, as he himself said, "accounted to him for righteousness."

His feeling for our own calling was one of keen appreciation and affection; he proved that more than once. As an evidence of this, and as a reminder of what he believed was true of the medical profession, we reprint today the address which he made to the Association at its meeting in Washington in 1902. The truths are as trenchant now as when he spoke them, and there is no reason to believe that he had less faith in us as the years went on than when he made the address.

We have all reason to be proud that he thought of us as he did; every right to hold our chins a little higher because he found in us a purpose and a will to carry on the inborn traditions of an honorable and generous profession. Can we not, even now, after he has crossed the Great Divide to the land of peace beyond, profit by what he said of us and of what he believed us capable?

What can we say of his passing? That we are regretful that he has gone? That we miss his presence and the fine example of his life? Yes, all who knew him and the fine ideals for which he stood must say that.

For those of us who felt his influence, either through direct personal contact or by the example of his life, it seems as though there must linger, so long as we have conscious recollection, a lesson which shall serve to help us up and on in this troubled journey to the place where he has gone.

He lived his life like a man and a Christian; he saw things clearly and met them face to face with the best he had to give and it is comforting to know that when his time came, the Angel with the flaming sword, who had so often stepped aside to let him pass, touched him gently at the end, and that he "wrapped the drapery of his couch about him and lay down to pleasant dreams." God rest him for a brave and gallant gentleman!

JAMES ROBB CHURCH.

ADDRESS BY THE HONORABLE THEODORE ROOSEVELT, LL.D.
PRESIDENT OF THE UNITED STATES

I am glad to have the opportunity to bid welcome to the members of this Association and their friends today. The men of this Association combine two professions, each of which is rightfully held in high honor by all capable of appreciating the real work of men—the profession of the soldier and the profession of the doctor. Conditions in modern civilization tend more and more to make the average life of the community one of great softness, of great ease, compared to what has been the case in the past, and, gentlemen, together with all the advantages that have come from this softening of life, this rendering it more easy, there are certain attendant disadvantages also. It is a very necessary thing that there should be some professions, some trades, where the same demands are made now, as ever in the past, upon the heroic qualities in a man, and those demands are made alike upon the soldier and upon the doctor; and how much more upon those who are both soldiers and doctors—upon the men who have continually to face all the responsibility and all the risk faced by their brothers in the civilian branch of the profession, and who also in time of war must face the same risks, often exactly the same risks, that are faced by their brothers in arms whose training is to kill and not to cure. (Applause.)

It has been my good fortune, gentlemen, to see some of your body at work in the field; to see them carrying the wounded and the dying from the firing line, themselves as much exposed to danger as those they were rescuing, and to see them working day and night in the field hospitals afterward, when even the intensity of the strain could hardly keep them awake, so fagged out were they by having each to do the work of ten. (Applause.)

I welcome you here. I am glad to have the chance of seeing you, and I wish to say a word of congratulation to you upon this Association. In all our modern life we have found it absolutely indispensable to supplement the work of the individual by the work of individuals gathered into an association. Without this work of the Association you cannot give the highest expression to individual endeavor, and it would be a great misfortune if the military members of the surgical and medical professions

did not take every advantage of their opportunities in the same way that it is taken by the members of the medical and surgical professions who are not in the army or the navy or the marine hospital service, but who are in civil life outside.

I am glad to see you gathered in this Association; and just one word of warning: Pay all possible heed to the scientific side of your work, perfect yourselves as scientific men, able to work with the best and most delicate apparatus—but never for one moment forget, especially the higher officers among you, that in time of need you will have to do your work with the scantiest possible apparatus (applause), and that then your usefulness will be proportioned not upon the adequacy of the complaint that you didn't have apparatus enough, but upon the way you have done with what you have. (Applause.) Remember that, and remember, also—and this especially applies to the higher officers—that you have got to supplement in your calling the work of the surgeon with the work of the administrator. You have got to be doctors and military men and able administrators. I thank you. (Loud and prolonged applause.)

THE WELLCOME PRIZE

The award of the first Wellcome prize to Col. Edward Bright Vedder, M.C., is the fifth honor of this kind which has come to our colleague since 1911, when he won the Association prize for his essay on the best available measures to diminish venereal disease among the soldiers and sailors. This was followed by the gold medal prize from the Military Service Institute (1911), the Seaman prize (1913), and the Cartwright prize for his book on beri beri (1913). Since he entered the Army in 1903, Colonel Vedder has been known to his profession and his corps as one of the most effective of modern workers in parasitic diseases and deficiency diseases. He gets results.

In 1910-11 he established the fact that emetine is a specific amebicide in the treatment of amebic dysentery, which at once led Leonard Hill and others to apply the principle in medical practice. His important findings on the etiology and prevention of beri beri as a "deficiency disease" are summarized in his well-known treatise of 1913. He has also done good work on dengue (1907), dietary deficiency as a causative factor in pellagra (1916), the military and public health aspects of syphilis (1918), and other problems of practical moment. His generalizations in regard to sputum-borne diseases in the European War, the subject of the prize essay, are of unusual interest to medical officers. We congratulate our colleague in the thought that to be five times a prizeman at forty is an earnest of other distinctions to follow in the years to come.

STOP, LOOK AND LISTEN!!!

It is strange, but nevertheless very much the fact, that that which is usual and very much in evidence becomes so much an habitual part of the surroundings that the fact of its existence is entirely overlooked.

For example, how many of those who read this paragraph can state definitely—as a matter of personal knowledge and not as a guess—as to what color the top stripe of the American Flag is and what color the bottom stripe is and how far down the blue field of the flag extends?

This preamble is by way of calling attention to the third paragraph of the small type matter on the title page of this magazine. It is the desire, naturally, of the editor to have his subscribers' copies of the magazine reach them promptly and without necessity for correspondence between them and this office, but to accomplish this result it is necessary for members to take cognizance of the request made in the paragraph already referred to, since the prompt arrival of the magazine to subscribers is dependent upon compliance with the requirements noted above. The paragraph referred to is as follows:

"The addresses of members and subscribers are not changed except upon request. In every case the old as well as the new address should be given. Requests for change of address must reach the secretary before the twentieth of the month to be effective for the following issue."

James Robb Church.

CURRENT LITERATURE

Tiefenantisepsis mit Chininabkömmlingen (Depth antisepsis with quinine derivatives). Bruns' Beiträge zur Klin. Chir., 113, 1., pp. 115-162.

The above title was given to the last of the four principal subjects discussed at the third meeting of the congress of German military surgeons at Brussels, February 11 and 12, 1918. Two formal papers were read (Dr. Klapp, Dr. George Schöne); six of the members took part in the discussion (Stich, Härtel, von Wassermann, Rosenstein, Ansinn, Morgenroth); six others submitted short papers of their experiences (Nordmann, Burckhardt, Haedicke, Fründ, Chr. Stieda, Ritter).

According to Dr. Klapp, "Vuzin" or "*Isoctychdrocuprein*" has derived its name from the bark of *Remijia cuprea*, not from cuprum (copper), and represents the most effective of the derivatives. The essential result of Morgenroth's investigations on the bactericidal power of the quinine derivative, we are told, are that they are effective even in albuminous solutions and in human serum and that they may penetrate the tissues without doing permanent damage to them. The application of vuzin solution to the wound surfaces not being satisfactory, K. undertook to send the solutions into the deeper lying tissues; to proceed from *surface* to *depth* antisepsis. In the case of a wound of the size of a hand and covered with necrosed tissues, a small area was injected to about the depth of 1 cm. beneath the wound surface, with 6 c.c. of a 1:10,000 vuzin solution. No damage to the tissues was noticed. The necrosed tissues overlying the injected area were cast off sooner than those of the other part of the wound. It was shown, later, that even solutions of 1: 5,000 and 1: 1,000 were well borne and without being followed by general or local unfavorable consequences.

From an experience with over 1,000 cases in which the effects of the vuzin solution, infiltrating the tissues surrounding the wound on all sides, were observed, K. believes he can discern three elementary factors at work: (1) a physical; (2) a bactericidal, and (3) a chemico-biological factor.

1. The *physical* component consists in that the injected vuzin solution shows a marked tendency to flow from the impregnated deep tissues was noticed. The necrosed tissues overlying the injected the loose dressings; the flow is more abundant in open than in closed wounds.

2. The *bactericidal* component, in K.'s opinion, is to be attributed chiefly to a reduced virulence on the part of the microbes. That this is the case and that the solution actually continues to exert its antiseptic action after having been injected into the tissues, is also seen

in its decidedly favorable influence when sent into the tissues surrounding furuncles, carbuncles and other inflamed areas.

3. The *chemico-biological* factor consists in an inhibition of leucocytosis as well as in the fact, observed by Morgenroth, that vuzin prevents the fermentation of carbohydrates in culture media and, consequently, gas production.

Klapp recommends the method to be used in *conjunction* with that of the early removal by excision of the dead parts from a wound preceding either primary or delayed primary or secondary sutur, and has applied to this combined procedure the term: *"reënforced prophylaxis"* against infection occurring in injuries caused by shell fragments and other wounds.

"Preparation of sol. Vuzin 0.1: 1,000: Dissolve 0.1 vuzin in 1 liter of normal NaCl solution, filter through cotton and sterilize.

Preparation of sol. Vuzin 0.1: 1,000 *with Novocain:* 10 ampules of novocain-suprarenin are dissolved in sol. vuzin 0.1: 1,000, filtered through cotton and sterilized. The two solutions must be prepared separately; a few drops of dilute HCl will suffice to dissolve the precipitate. Since the solution does not keep indefinitely, it is best not to use one older than 8 days. K. recommends an alcoholic stock solution of vuzin 1: 50 from which a 1: 5,000 solution may be made such as he has usually employed.

Indications for the employment of the method of reënforced prophylaxis with excisions and vuzin infiltration to wounds:

1. The method, at present, is to serve only as a means for the prevention of infection and not as one of the treatments of already existing suppurations.

2. The *complete* prophylaxis consists in the early wound excision with the infiltration with vuzin. When the admissions are too numerous, the *partial* prophylaxis, by infiltration of vuzin, the enlargement of the wound and the removal of foreign bodies alone will be practicable.

3. The first excision must remove all dead tissues, including the scattered fragment of shells; after the excision, all parts of the wound are to be infiltrated with vuzin solution at a distance from the wound surface of 1 to 6 cms. Caution is to be observed with skin flaps and with fingers so as not to diminish the circulation in them too greatly.

4. The same treatment applies to bone-injuries. After removal of bony splinters, deprived of their periosteum, the vuzin solution is introduced between the bony fragments, subperiosteally and into all the tissues surrounding the fracture. New drainage outlets are made through sound tissues.

5. Injuries to joints: The track is to be excised; the capsule is punctured from the sound side, the joint irrigated with vuzin solution and sutured, if practicable; irrigation may be repeated; the treatment should begin before infection has occurred.

6. In all injuries an early fixation of the parts by appropriate splints is of prime importance.

7. A too frequent change of dressings is to be avoided and permanent dressings are to be aimed at.

8. In spite of the fact that cleanly excised wounds may be sutured, this recommendation must have its exceptions; the decision must be left to the individual judgment of the surgeon. The open-wound treatment in conjunction with the method of reënforced prophylaxis of wounds must be considered safer, inasmuch as it admits of correct drainage and best prevents the progressive extension of the infection. The partial or complete closure of wounds, however, has this in its favor, namely, that it places the tissues under better physiological conditions and also tends to retain the vuzin solution in the injected parts for a longer time than is the case with open wounds.

The secondary or deferred suture is possible after the second or third day, and even later after the fifth or sixth day. The delayed formation of granulation, due to the quinine treatment, has the advantage of rendering the danger from infection through the secondary suture less imminent than it is when granulations have already made their appearance. Renewed infiltration with vuzin should accompany the putting in of the secondary suture. In the after-treatment of open wounds the formation of granulation may be increased through the application of stimulating lotions such as "camphor-wine" and turpentine emulsion (1 to 10 per cent).

The results so far obtained, given in detail, impress the reviewer as showing the advantages of the vuzin-infiltration method to reside in the fact that the treatment prevents the infection of the sound tissues in the neighborhood of serious war wounds after the manner of an inhibiting *"barrage."*

The limited amount of space reserved for abstracts unfortunately prevents the reviewer from including the remaining papers and the discussion in this abstract; a few of the remarks, added to the protocol of the proceedings by Dr. Haedicke, because of their originality and general interest, we are sure, will find interested readers. These remarks have reference to the principles underlying the origin and the prevention of the deep-seated secondary infection, the treatment of which by an ever-increasing number of new antiseptics, and in spite of them, remains in an unsatisfactory state. Dr. Haedicke attributes these failures, in its essential part, to a too one-sided attention paid to the antibacterial power of an antiseptic. Infection, he says, is not yet identical with suppuration and *antiseptic* is not synonymous with *pus-producing;* he sees in suppuration only the outward expression of the great attraction exerted by the pyogenic bacteria upon the leucocytes, these "wandering vagabonds" (positive chemotaxis), streaming from neighboring spaces, lymph channels and blood capillaries in the direction of the focus of the infection where they become

pus cells. As they often contain dust particles and microbes, Metchnikoff's theory sees in such immigrations a mechanism for the destruction of pathogenic bacteria. This theory, we are told, does not take account of what happens when the bacteria, thus included, and not the phagocytes that carry them, survive, and in which case the dead phagocytes serve as a welcome culture medium for the bacteria which then show not only a rapid numerical increase but also increased virulence by virtue of frequent passages through them. This increase in number (from a few to millions) and in virulence constitutes the *shady side* of phagocytosis, though, still, not its greatest danger to the organism as a whole. As long as pus remains localized, the danger remains local, but as soon as the bacteria-containing leucocytes return into the lymph and blood channels, they infect, in their capacity of bacillus carriers, healthy tissues, giving rise to metastases, inflaming lymph spaces and glands, joints, peritoneum, pleura, meninges, also causing pyemia and sepsis.

While admitting the possibility of motile organisms (typhoid, coli and cholera bacilli) wandering independently through tissue walls, the non-motile microörganisms cannot do so except through phagocytes acting as their carriers. The transportation of even tubercle bacilli into the lymph channels without the aid of leucocytes forms a negligible factor. When it becomes, therefore, a question of treating infectious diseases and wound infections, of preventing dangerous metastases and depth infections, we must not limit our destructive efforts against bacteria alone but extend them to the phagocytes as well, "these most dangerous of all germ carriers." Haediecke points out that the most toxic bacteria are not necessarily also the most dangerous in this regard; these are the bacteria that survive their hosts.

These measures are, in principle, the same, in peace or war, upon which our endeavors in the struggle with mass-infections must be based:

1. Retention of pathogenic germs at the focus of infection.
2. Their separation from the tissues surrounding this focus.
3. The early removal of them from the body.

Even tuberculosis is disseminated through phagocytes. As long as the tubercle bacilli remain on the surface of mucous membranes, they are not dangerous; they become so only after having been transported to the deeper tissues by phagocytes and, in this way, have increased in number and virulence. The author then points out the relation that some of the old antiseptics possess to the destructive action of leucocytes. Referring to the well-known specific action of quinine on the *plasmodium malariae,* a protozoon, he sees a close relation in the reduction of pus cells, the *ameba sanguinis,* due to the same agency (quinine). He then cites instances from his extensive practical experience in which the application of quinine in its different forms has proved efficacious in purulent inflammations of the skin and of subcutaneous tissues by virtue of the destructive action on leucocytes.

In the antiphagocytic action of quinine preparations, our author therefore sees a remedy for the prevention of secondary purulent inflammation, and metastatic infections in lymph and blood channels.

The sessions were all held under the presidency of the chief medical and sanitary officer of the armies in the field, General von Schjerning.

H. G. Beyer.

On the Treatment of Shoulder Dislocations without Bandages and with Immediate Active Motions, by Dr. Lorenz Böhler, Bozen. Münch. Med. Wchschr., No. 27, July, 1918, pp. 734.

The author, after citing the literature on the different methods of treating dislocations at the shoulder joint, describes his own method, which appears to the reviewer as both physiologically and surgically sound as well as, practically, an advance over older methods.

Immediately after the reduction of the dislocated head of the humerus, he places a stick into the hands of his patient, requesting him to raise both arms. This was done successfully in every fresh case in the fifteen he had occasion to treat in this manner; in those that had been reduced after some days, the maneuver was carried out within one week. Then the patients carried the stick behind the head, a movement signifying the greatest measure of abduction and elevation, and also the maximal outward rotation. At the end of a week's treatment, all the fresh cases carried out all active movements to the fullest extent. On the fourth and fifth days movements with weights over pulleys were begun. At the end of a month the full power of the arm was restored, and this result had been attained without the use of massage, hot air, electricity or hot baths. Among the cases were, furthermore, included those in which the dislocation had been complicated by copious hemorrhage; indeed, active movements were especially required to be done in just such cases. In one of the fifteen cases the reduction had been successful only after the seventh day, in spite of two attempts at reduction having been made by outside physicians. On admission a paralysis of the radial nerve was found. In spite of this late reduction and the presence of radial paralysis, free movements at the shoulder were carried out after fifteen days' treatment and the paralyzed radial restored to normal function. H. G. Beyer.

Quelques observations sur les oreillons (Some observations on mumps), by L. Capitan. *Bull. de l'Acad. de Méd.*, t. lxxx, No. 35, 3 September, 1918, p. 197.

The author has treated about 700 cases of mumps in the military hospital for contagious diseases at Bégin: 316 cases in 1914, 1915 and 1916; 189 in 1917; 194 in the first eight months of 1918. The number of cases in 1918, therefore, is larger than in previous years. As new in symptomatology may be considered the discovery of a temporary en-

largement of the spleen, the appearances occasionally of a rubeolar eruption of the body, and, also, those of meningeal symptoms, marked by intense headache, photophobia, unequal pupils, slow pulse, stiff neck and Kernig; the spinal fluid showing the presence in it of large numbers of leucocytes. The author considers the disease as a polymicrobic blood-infection, promising to report the results of his bacteriological investigations to the academy later. H. G. Beyer.

The Rôle of the Evacuation Hospital in the Care of the Wounded, by Daniel Fiske Jones, M.D., Boston, Mass. *Annals of Surgery,* vol. lxviii, No. 2, August, 1918, p. 127.

The author's account underlines once again the great significance of the time element as being the largest common factor in the successful treatment of war wounds. One can hardly read these reports without being amazed and stand aghast at the exasperating slowness with which even the most essential truths, noted over and over again, work their way into general recognition. The, no doubt, admirable results obtained at La Panne and Compiègne as compared to those obtained at other base hospitals are recognized; they were, however, at first at least, attributed more to the employment of certain antiseptic methods than to the more important factor of time. Patients at La Panne "are received directly from the front, usually within twelve hours of the time of being wounded," whereas at base hospitals about three days elapse before they arrive after being wounded and "with little or no early treatment." It is becoming at last more and more certainly recognized that the *sine qua non* of success lies, "not in the antiseptic used, but in the early radical excision of devitalized tissues."

Local death and dissolution always follow immediately upon an injury to the tissues; such changes are irreversible; no antiseptic known to chemistry, physics or biology can delay this process. The omnipresent bacterial flora begins at once to invade and to thrive on and within such tissues. Granting that antiseptics do impede and even inhibit bacterial invasions, they can never recall dead tissues back to life and may not always reach the offending bacterial organisms, pullulating on dead tissues, sending their toxins into the circulation. Hence the obvious necessity and the great benefit derived from the earliest possible radical excision of such tissues from a wound which the war once for all time has demonstrated.

The evacuation hospital or casualty clearing station, from an institution existing only on paper before the war, has developed into one of the most important stations for the early treatment of war injuries. "It will be seen that the evacuation hospital must be a combination of field and base hospitals. In location and in the early treatment of the wounded it may be considered a field hospital; in size, permanency, equipment and the work it does, it may be considered a base hospital."

From the author's account it appears that the evolution of the evacuation hospital is a direct reflex result of the overcrowding of the base hospital with patients arriving in the latter three days after being injured, poorly treated, all the cases being infected with gas bacilli or streptococci. The evacuation hospital had of necessity to assume more and more the function of the base hospital and more experienced general surgeons had to be sent to these hospitals to make them do more efficient surgical work than they had been doing. As the author remarks: "From experience at a base hospital, I am convinced that the evacuation hospitals and mobile units should first be equipped with staffs of surgeons of well-known ability and experience, after which the base hospitals should receive their 40 per cent of experienced surgeons, if it is possible to get them." In the reviewer's experience and opinion, the author touches here upon a common mistake made in every one of the belligerent countries at the beginning of the war, namely, the sending of the young and inexperienced surgeons to the front to attend to the first treatment of the wounded; it seemed to have been utterly forgotten that the first treatment was also the most important and should have required the best and most experienced of surgeons as a matter of course; the very contrary was done; it was a horrible mistake—an almost unpardonable sin!

"The deaths, the disabilities, the suffering and enormous loss of time caused by sepsis, which in turn is caused largely by delay and inefficient operations, are impossible to compute . . . evacuation hospitals, when properly equipped and with permanent staffs of surgeons of known ability and experience," as they are at present, are the results of three years of costly and tragic experience.

H. G. Beyer.

La lutte contre les moustiques et contre les insectes ailés vecteurs de maladies (The fight against mosquitoes and against winged disease-carrying insects.) Abstracted from *Rivista di Igiene e di Sanita pubblica*, February, 1918, in *Office internat. d'Hygiène publique*, t. x., Juin, 1918, p. 713, by E. Bertarelli.

The conclusions which the author derives from his researches would make it appear as if we were at last in possession of a practical and efficient means of combatting the ravages of, at least, adult mosquitoes. The author sees this dreaded enemy to mosquitoes in a fluid capable of pulverization in places where the insects abound and breed, without giving rise to inconveniences to persons or other damages.

The fluid is known as *Giemsa's solution* and has the following composition: Tincture of pyrethrum, 560 grms.; potash soap (soft soap), 180 grms.; glycerine, 240 grms. This stock solution is diluted with 20

volumes of water just before using it. The pyrethrum tincture is prepared as follows: 20 parts of powdered pyrethrum are macerated in 100 parts of 96 per cent alcohol, denatured with a 2.5 per cent methylic alcohol. Any good spray machine, the nozzle of which gives a fine, cloudy spray, may be employed, but it should be kept in mind that the destructive effect of the mixture will be in direct proportion to the fineness of the spray it produces. H. G. Beyer.

Témoin bacteriologique pour vérifier la sterilisation des instruments et pansements (The bacteriological witness for verifying the sterilization of instruments and dressings), by E. Rousseau. Abstr. from *Arch. de Médecine et de Pharm. Milit.*, t. lxix, No. 4, Avril, 1918, p. 593.

The following is a description of an economical and simple process for preparing a test, devised by M. Rousseau and employed by him successfully for over a year at the surgical automobile hospital, No. 4.

A series of strips of filter paper is charged with a culture of *B. subtilis* of at least a week's standing. The resistance of this spore-bearing bacillus to heat is known to be greater than that of *B. tetani, Vibrio septique,* and *B. putrificus.* The strips of paper, impregnated with a young culture, dried afterward, are, then, efficient bacteriological witnesses.

The culture medium is prepared as follows: Peptone, 0.50; NaCl, 0.20; water, q. s. ad., 100.0 c.c.

In this medium the bacillus is cultivated at 37° for eight hours and the strips of filter paper immersed until completely saturated; dried, afterward, in the oven at 37° and then kept in a closed glass tube. The strips, thus prepared, may be used, at the rate of one for each lot and placed amidst the dressings. It is a good plan, for the final seizure and withdrawal of the "witness" to tie the compresses or thicknesses of cotton, containing the strips embedded in them, by a string: on its removal from the autoclave, the pot is opened, the string is seized with a sterile forceps, the strip of paper found and withdrawn by means of a flamed forceps and transferred either directly into a previously prepared culture tube or into a sterile tube to be sent into the laboratory.

For instruments and gloves, the technique is still simpler; it suffices to place the strips between the instruments or at the entry of the gloves. The procedure has demonstrated its great value; the expense is reduced to the preparation of some test tubes of peptonized and sterilized water and some strips of filter paper.

H. G. Beyer.

The Treatment of "Causalgia" of the "Median," with Serious Paralytic Troubles, Through Ligation of the Nerve with Catgut, by Lortat-Jacob and G. B. Halley. Abstracted from *Arch. de Méd. et de Pharm. Milit.*, t. lxix, No. 4, Avril, 1918, p. 594.

"Causalgia" of the median nerve, a very painful form of traumatic lesion of this nerve, though well known clinically, is still under discussion etiologically. At the present time, it would seem as if we must look for its cause in an irritation of the sympathetic nerve-fibers accompanying either the nerve itself or its nutrient arteries or their collateral branches (the brachial in the arm, the interosseous in the forearm).

We know that Leriche has already advocated the *periarterial sympathectomy.* Lortat-Jacob and Halley believe that the results obtained by them through the ligation by catgut, moderately tight, of the nerve trunk itself, above the lesion, are at least as good. This was done recently, at their suggestion, by Mouchet, on a gunshot wound, caused by a shell, of the right arm that was immediately followed by a paralysis of the median and ulnar nerves and division of the brachial artery for which latter, the artery had to be ligated. The syndrome of complete interruption of motor phenomena was complicated by very marked sensory, secretory and vasomotor troubles of the causalgic type over the area of distribution of the median. An incision, made above the neuroma, revealed the presence of a very thick, very vascular and edematous median, to the extent of 5 cm. A ligature with No. 1 catgut, moderately tight, was applied around the subaxillary portion of the nerve, above the neuroma. The following day the pains had completely disappeared never to return. At present, after a period of two months, the motor paralysis has not changed, but an almost complete anesthesia in the region of the median has taken the place of the painful hyperesthesia, of the vasomotor and secretory troubles, such as purple, cold, viscous skin, enormous lowering of arterial tension.

It is conceivable that the ligature with catgut, moderately tight, may for a time inhibit or suppress the sympathetic, perinervous irritability and the congestion of the nerve trunk, without injuring the nerve fibers proper in the process of regeneration, centrifugally, and thus put an end to the painful phenomena of the causalgia.

H. G. Beyer.

BOOK REVIEWS

THE DOCTOR'S PART: What happens to the Wounded in War, by James Robb Church, A.M., M.D., Colonel, Medical Corps, U. S. A., with foreword by Maj. Gen. Wm. C. Gorgas, Surgeon General, U. S. Army. Illustrations. New York and London: D. Appleton & Company, 1918. Price, $1.50.

On November 15, 1915, Colonel Church was assigned to duty as a military observer with the French Army in the field. This volume is a record of his experiences, covering two years spent on the western front, latterly on the staff of the commanding general.

The object of the book is to convey, in simple and unpretentious language, an account of the medical organization of the French military establishment, which will be intelligable even to laymen. The author has attained this end through the possession of a literary style of rare ease and charming simplicity. In a few simple chapters we are shown the workings of the entire French sanitary service from the administrative bureaus to the hospitals of the interior and through other sources of the Army up to the very front line. In the introductory chapter the writer's difficulties with the French language and in getting about Paris are amusingly described. The details of the French medico-military administration in the General Sanitary Service, the hospitals of the interior and at the front, occupy the rest of the volume, with a special chapter on transportation.

The information is simple, compact, accurate, yet conveyed in the attractive manner of some affable raconteur in one's club. Every paragraph is readable. The book is quite as valuable for what has been left out of it as for what it contains. Whoever begins the volume will probably not lay it down until he has finished it, for it is one of those pleasing books which can be read at one sitting. The norm of a good, modern prose style, which has been described as to write as if we are conversing, is measurably attained throughout. Every medical officer and every medical reserve officer of the Army ought to read this unpretentious volume, not only for its valuable content but as an object lesson in what can be done to make matter, dry in essence, attractive through simplicity and charm. If it be true, as Dr. Johnson observed, that "Easy (*i. e.*, irresponsible) writing is such damned hard reading," then much more serious work than appears on the surface has gone to the making of this very readable, yet instructive, volume.

F. H. G.

THE RADIO-DIAGNOSIS OF PLEURO-PULMONARY AFFECTIONS, by F. Barjon. Translated by James A. Honeij, M.D., Assistant Professor of Medicine in Charge of Radiograhy, Yale Medical School. New Haven and London: Yale University Press.

As the name implies, this work is strictly a treatise upon the diagnosis by means of the X-ray of thoracic disease. A knowledge of radiological technique on the part of the reader is assumed, and reference by the author to technical details is limited to directions as to height of tube and as to examinations of the patient in the various positions. While fully conscious of the great value of the contributions of radiology to the diagnosis, the author

emphasizes the dependence of the radiologist upon the physician: "It is always the physician who ought to decide in the last analysis." The radiologist must, he says, have a thorough medical education in order to be truly proficient in his art. It is quite evident, upon a perusal of this work, that its author fulfils his own conditions. The trained and experienced clinician is in evidence constantly in the descriptions from the radiological standpoint of the multifarious pathological conditions.

The book is not always easy reading, and the condensed treatment of the subject is not one that the beginner might prefer. But especially as a book of reference in the diagnosis of the relatively more obscure manifestations of thoracic disease the work of Barjon is invaluable. The author might well have emphasized more the value of the radiograph in the detection of small and deep-seated cavities or of disseminated tuberculous foci which have not approached the surface of the lung sufficiently to become accessible to ordinary physical diagnosis. He remarks that pulmonary tuberculosis represents almost the whole of pathology in its innumerable forms and variations of onset and development and its many complications, a statement which might well be brought to the attention of those who find the disease an uninteresting study.

The author characteristically devotes his attention especially to the solution of the difficult problems of diagnosis in the unmasking of the more recondite forms of pulmonary tuberculosis. The chapter on pleurisy discusses in detail the rarer manifestations of that disease.

The book closes with a timely chapter on penetrating wounds of the thorax by war projectiles, in which the experience gained in the present war is recorded. A note by Maj. J. S. Shearer appended to this chapter gives an account of the standard methods of localization adopted by the roentgenological experts of the American Expeditionary Forces. Numerous radiographs and diagrams elucidate the various conditions discussed. The translation by Professor Honeij is very well done. The work is to be regarded as a very valuable addition to the radiological literature which is accessible to the American medical profession. GEO. E. BUSHNELL.

COMPENDIUM OF HISTOPATHOLOGICAL TECHNIC, by Emma H. Adler, formerly Technician, Pathological Laboratory, Presbyterian Hospital, New York. New York: Paul B. Hoeber, 1918. Price, $1.25.

This little compilation is not offered as a substitute for the standard text-books on histological technique, but is intended merely to supply the student untrained in laboratory work with a brief and handy account of the methods that have been found most useful in the pathological laboratory of the Presbyterian Hospital. The various procedures are described plainly and with sufficient detail, so that the work is made as easy as possible for the beginner.

FRANCIS M. MUNSON.

UNITED STATES ARMY X-RAY MANUAL, Authorized by the Surgeon General of the Army. Prepared under the direction of the Division of Roentenology. 219 illustrations. New York: Paul B. Hoeber, 1918. Price, $4.

This manual has been prepared to serve as a guide to roentgenologists who are doing the X-ray work in the army hospitals and as a text-book for instruction in military roentgenology. It is not intended to be a complete

treatise on roentgenology, but in the portion devoted to X-ray diagnosis the facts that have been established by experience have been stated concisely and clearly. All controversial points have been avoided. The principal aim in the preparation of the manual is to familiarize the already experienced roentgenologist coming into the Army with the apparatus with which he is to work, and to give him additional instruction along any lines in which he may be deficient.

The plates and diagrams are splendid, the paper is excellent, and the volume is of convenient size, bound in flexible leather.

FRANCIS M. MUNSON.

EQUILIBRIUM AND VERTIGO, by Isaac H. Jones, M.A., M.D., Laryngologist, Philadelphia General Hospital; Instructor in Neuro-otology, University of Pennsylvania Medical School; Associate American Otological Society; Major, M. C., U. S. Army. With an analysis of pathological cases by Lewis Fisher, M.D., Laryngologist and Otologist, Mount Sinai Hospital, Philadelphia. Adopted as standard for Medical Division, Signal Corps, Aviation Section, by Surgeon General and by Chief Signal Officer, U. S. Army. With 130 illustrations. Philadelphia and London: J. B. Lippincott Company, 1918. Price, $5.

This carefully prepared work is a successful effort to introduce a somewhat new subject to the profession. An idea of the scope of the book may best be obtained by a glance over the chapter headings:

Part I—The Practical Uses of a Study of the Internal Ear: I, Neuro-otology; II, The Ear and the General Practitioner; III, The Ear and Aviation; IV, The Ear and Seasickness; V, The Ear in Syphilis; VI, The Ear and the Neurologist; VII, The Ear and the Surgeon; VIII, The Ear and the Opthalmologist; IX, The Internal Ear and the Otologist.

Part II—The Study of the Internal Ear: X, The Development of Neuro-otology; XI, Anatomic and Physiologic Considerations of the Labyrinth and Seventh Nerve; XII, Medulla Oblongata, Pons and Cerebellum; XIII, Cerebellar Localization; XIV, Tracts of the Auditory Apparatus and the Vestibular Apparatus; XV, Vestibular Nystagmus; XVI, Vestibular Vertigo; XVII, Pointing Tests of Barany; XVIII, Technic of Examination of the Auditory Apparatus and of the Vestibular Apparatus; XIX, Examination of a Case with the Use of a Chart; XX, Practical Considerations; XXI, Pathologic Considerations; XXII, Hypothetical Cases; XXIII, Pathologic Cases Analyzed.

The author has placed at our disposal information not heretofore available. He has had the collaboration of a number of eminent men, among others Dr. B. Alexander Randall, Dr. Charles K. Mills, Dr. William G. Spiller and Dr. Charles H. Frazier. The text is carefully written, the diagrams and photographs have been painstakingly perfected, and the outline of the book and the arrangement of the chapters are very commendable.

FRANCIS M. MUNSON.

THE DOCTOR IN WAR, by Woods Hutchinson. Illustrated. Boston and New York: Houghton Mifflin Co. Price, $2.50.

Dr. Hutchinson spent nearly a year "over there" studying the work of the Sanitary Service on the western front. Arriving in France almost co-

incidently with the first of our troops, he had the opportunity of following our side of the game from the beginning, and the facilities afforded him by the French, British and Italian authorities gave him every chance of seeing at first hand the things whereof he speaks.

He has not written a book of horrors, which might be the assumption from a title which carries the suggestion of operations and hospitals. His is a cheerful book, not only because he has made it so but because in the recital of the methods of combating wounds and disease by modern methods there is much that is cheering. Where in older times the fortune of those who fell sick or injured in time of war was a precarious one, in these latter days of advancement the chances for recovery are such as to rob the subject of much that is gruesome. Dr. Hutchinson writes understandingly, as a member of the profession, and he writes, as always, with that delightful human touch, that whimsical trait of quaint humor which characterizes his style. He tells us sober facts too, things which it is well to know and things which the average layman is ignorant of. This knowledge is not imparted in technical language bristling with formidable terms, but in words which mean things to those uninstructed in the jargon of the doctors.

Among the chapters we note "The Superb Health of the Armies" and "The Land of the Happy Warrior and the Cheerful Wounded" as evidence of the non-gruesome character of the book.

Among other chapter titles are "The Risks of a Red Cross Nurse," "A Day in a Field Hospital," and "Gas Clouds and Gas Shells." These go to show the versatility of what he has written and, as has been said, are all interesting from the personal side.

Aside from the excitement of the shock of conflict, there is much that is noble and admirable in the reconstructive side of war; the patient patching of the human wreckage which drifts to the rear to be made whole again. There have been many battles fought in the hospitals and a great deal of real bravery shown by both doctor and patient behind the lines.

The book is well printed and attractive in appearance and the illustrations are well chosen and clear. We regretfully confess we should have felt better if the good-looking eleven on page 44 could have been something besides "Lady Ambulance Drivers" and if their sisters on page 120 need not have posed as "Lady Lorry Drivers." Of *course* they are "ladies," bless their dear souls, but when they go to war for us, we colonels and corporals and privates like to think that they are there to help us just because we are their men and they, our women. JAMES ROBB CHURCH.

GLOSSARY OF AVIATION TERMS: ENGLISH-FRENCH AND FRENCH-ENGLISH. Illustrated. Compiled by Lieut. Victor W. Page, A. S. S. C., U. S. R., and Lieut. Paul Montariol, French Flying Corps. New York City: The Norman W. Hendley Publishing Co. Price, cloth, $1.00.

This is a compact dictionary of the terms in use in aviation, giving the equivalents in French as well as English. Under separate headings are grouped the terms used on the flying field, in the shop, in regard to tools and the nomenclature of the various parts of the machine. It is attractive in appearance and should be of value to anyone who must approach the subject from the French as well as the English side. The illustrations are clear and ample to supplement the text.

THE SURGICAL CLINICS OF CHICAGO. Volume II. Number 4, August, 1918. Philadelphia and London: W. B. Saunders Company.

This number will compare favorably with most of those preceding. The clinics are increasingly valuable contributions to the medical profession, written, on the whole, by men whose experience justifies confidence in their teachings.

Not only has the publication increased in value to the profession, but a comparison of the later numbers with the earlier ones shows a definite increase in the ability of the teaching clinicians to express themselves so as to be interesting and instructive. A clinical teacher who can hold an audience which, when it goes away, has a feeling of having learned something not usually acquired through didactic lectures or reading, is worth while listening to; he has impressed his personality. Several of the men whose lectures appear very regularly are materially aiding in building up for Chicago a high reputation as a surgical teaching center, that may well stimulate other sections of the country to bring their abilities and wealth of material to the notice of the profession. It seems to have been forgotten by some of the older medical centers that "Westward the course of empire takes its way."

JNO. E. SUMMERS.

THE ORTHOPEDIC TREATMENT OF GUNSHOT INJURIES, by Leo Mayer, A.M., M.D., Instructor in Orthopedic Surgery, New York Postgraduate Medical School and Hospital. With an Introduction by Col. E. G. Brackett, M. C., N. A., Director of Military Orthopedic Surgery. Cloth. Price, $2.50 net. Pp. 250, with 184 illustrations. Philadelphia: W. B. Saunders Company, 1918.

A book written by Dr. Mayer commands attention. The work before us represents the thoughtful presentation of an important subject.

The field covered is an extensive one. The book is divided into two parts: Part 1, At the Front, comprises four chapters treating respectively of Fractures and Injuries of Joints; Injuries to the Nerves; Injuries to the Muscles, Tendons and Cutaneous Tissues; Transportation of the Wounded.

Part II, At the Base Hospital, is comprised of chapters treating of Bone Injuries; Joint Injuries; Contracture; The Treatment of Nerve Injuries; Injuries to Tendons, and Tendon Operations; Treatment of the Amputated; the Aims and Organization of the Reconstruction Hospital.

That Dr. Mayer should be able to discuss, in an instructive and not haphazard way, so many subjects within the scope of 244 pages is in itself a remarkable achievement and is due to the author's literary, scientific, and practical knowledge of what he attempts to teach. In his preface Dr. Mayer says: "This book is not a treatise on orthopedic surgery. Its purpose is merely to emphasize certain principles and rules of guidance, in the treatment of war injuries, that have been useful to me." That the author has been successful in his undertaking is without question.

JNO. E. SUMMERS.

CLINICAL AND LABORATORY NOTES

A CASE OF SUPPURATIVE CELLULITIS OF THE LEG TREATED BY THE CARREL-DAKIN METHOD AND DELAYED SUTURE; PRIMARY UNION FOLLOWING

By 1st Lieutenant FRED W. EASTMAN

Medical Corps, United States Army
Base Hospital, Camp McClellan, Anniston, Ala.

June 3, 1918, a healthy private, 23 years of age, suffered a contusion on the inner surface of the lower third of his left leg, caused by falling of an automobile wheel against the leg. There was no abrasion and only slight pain was noted at the time of injury. The next day he drilled and did full duty.

June 5 he was admitted to the base hospital with a temperature of 102°, redness, swelling, and pain at the site of trauma. The foot was elevated and a hot magnesium sulphate dressing applied.

June 6, the temperature was the same and there was less pain, but local signs of suppuration were present. The treatment was continued.

June 7, the X-ray proved negative. The temperature still being 102°, the abscess was opened under general anesthesia by a Y-shaped incision 13 cm. long, freeing pus and exposing much necrotic tissue. Culture of the pus gave no growth.

June 8, the temperature was 101.4°. A smear from the incision showed cocci and diplococci, one per field. After careful toilet of the wound and adjacent skin two No. 5 Carrel tubes were placed in sinuses (one of them 4 cm. deep), at the upper end of the abscess cavity, and two others of the same size were placed in pockets under the skin edges at the lower end of the cavity. The adjacent skin was protected with strips of gauze impregnated with vaseline and irrigation at intervals of two hours night and day with 50 c.c. of Dakin's fluid (0.48 per cent sodium hyposulphite and sufficient alkalinity to turn an alcoholic solution of phenolphthalein red but not to affect powdered phenolphthalein), was ordered.

June 9, the temperature was 99.6°, and did not rise higher on any subsequent day. The abscess cavity was cleaner and brighter and the smear showed one coccus per field. Dakin's solution was continued 50 c.c. every two hours.

June 10, 48 hours after commencing treatment with Dakin's solution, a large slough of fascia and fat, 3.5 by 1 cm., was found much loosened by the effect of the solution and was easily removed.

Redness had at this time disappeared from the surrounding tissues and the foot was much less swollen. No smear was taken. Dakin's solution was continued.

June 11, the abscess cavity was still cleaner. The smear showed one coccus to 2.5 fields.

June 12, two new sinuses, 1 cm. and 2.5 cm. deep, were found under the skin at the upper end of the cavity, and the two tubes in the old sinuses, now almost closed, were shifted to these. No smear was taken. Dakin's solution was ordered, 25 c.c. every hour.

June 13, almost all necrotic tissue had disappeared from the cavity, leaving a bright muscular surface. The smear showed no bacteria in 20 microscopic fields. Dakin's solution was continued 25 c.c. every hour.

June 14, three tubes were removed from the lesion and the edges were drawn as close together as possible with sterile adhesive plaster. In the 1 cm. wide space remaining between the edges one Carrel tube was left and Dakin's solution was instilled 15 c.c. each hour.

June 15, the seventh day after institution of treatment by the Carrel-Dakin method, it was not possible to express pus from any part of the edge of the abscess cavity and all necrotic tissue had disappeared. The smear from the cavity and the skin edges showed only one coccus to 1.6 fields, so it was considered safe to close the wound, as the smear from the cavity June 13 had shown no bacteria in 20 microscopic fields. Accordingly, under local anesthesia, novocaine 1 per cent, with adrenalin, 2 mm. were excised from the edges and with considerable tension in the middle the fresh edges were brought together. This was done without undercutting, as scar tissue had not yet had time to form. Linen sutures were used so that, had it been necessary to open the wound again on account of recurrent infection, a few stitches could have been removed and Dakin's solution again applied to the affected area without opening all of the wound. Silk and catgut sutures are soluble in Dakin's solution.

June 16, the line of suture looked well and there was no swelling of the foot due to the tension of the skin caused by suturing. Dichloramine-T was applied to the line of sutures.

June 17, apparently primary union was taking place. There was no redness or swelling. Dichloramine-T was again applied.

June 18, the tenth day after the institution of treatment, all sutures were removed.

June 20, the patient walked without permission a considerable

distance and the expansion of contracting muscles forced open about 1.5 cm. of the scar near the middle.

June 22, the above opening was freshened and sutured.

June 26 these sutures were removed, leaving a linear scar freely movable on the tissues beneath. Such a scar is not liable to ulceration and is much more sightly than a wide one formed by granulation and epithelization. Of course the shorter stay of the soldier in the hospital is the most important result of sterilizing and suturing such abscesses.

FRACTURE OF SESAMOID BONE OF GREAT TOE[1]

By Maj. J. N. BAKER and 1st Lieut. T. H. LANMAN
Medical Corps, United States Army

The following brief report of a case of fracture of the sesamoid bone of the great toe, is stimulated by an interesting article by Dr. Orr of Kansas City, Mo., appearing in the May issue of *Annals of Surgery.*

This author, upon reviewing the literature, could find but 24 cases, exclusive of his own.

Our case was that of a soldier, who, while helping to move a latrine, caught his right foot under one of the rollers used in moving the structure. He immediately experienced sharp, severe pain in his foot and was brought to the base hospital. Upon admission there was some swelling and tenderness in the region of the great toe, but the initial sharp pain was of short duration. The foot was immediately X-rayed, showing a fracture of the tibial sesamoid bone of the great toe, without evidence of other bone lesion. After a few days' rest in bed and adhesive strap dressing, the pain and tenderness subsided. He was permitted to walk at the end of a week with a stick and returned to full duty within two weeks. The chief interest of this case, aside from its rarity, was that it brought to our attention the problems of diagnosis and treatment which this condition involves, especially from the point of view of the military surgeon.

In spite of its apparent rarity many casess doubtless go unrecognized, by reason of the failure systematically to employ the X-ray.

Dr. Orr speaks of the difficulty of diagnosis and the variety of primary diagnosis "from arthritis deformans to metatarsalgia."

---

[1] From the *Surgical Service,* Camp McClellan, Alabama.

One case in his series was treated by metal arch supports by an orthopedic surgeon, and later for arthritis by an internist. He also points out what is of more practical importance to the military surgeon, namely, that the disability resulting from this injury may extend over a great length of time—weeks or months—unless proper treatment is promptly inaugurated. Although in our own case we got no history of subsequent trouble, it has seemed advisable that future cases be treated with more prolonged rest, either in bed or by the use of crutches, to avoid bearing weight on the foot for at least a month.

For example, in Dr. Orr's own case the condition was unrecognized for two weeks, when the X-ray showed a fracture of the tibial sesamoid. There had been considerable pain for the first few days, followed by moderate pain on walking. The physical signs were very slight, there being practically no swelling or redness. Shortly after the X-ray was taken, the patient forcibly hyperextended the great toe and experienced further severe pain, which continued in greater or less degree on walking for two weeks, when a second X-ray showed marked separation of the fragments previously demonstrated. The patient then used crutches for two weeks and a cane for eight weeks longer; during this period he was always conscious that "something was wrong beneath the great toe." Even eleven months after the injury, he had some discomfort when walking on rough, uneven ground.

The injury is caused by direct violence in the majority of cases; only three of the 25 cases cited by Dr. Orr were due to indirect force. The crushing or squeezing type of force is the commonest. The injury occurred most frequently in males of active adult life.

Gray defines the sesamoid bones as small rounded masses, cartilaginous in early life, osseous in the adult, developing in those tendons which exert a great amount of presssure upon the parts over which they glide. They are more commonly found in the male and in persons of an active muscular habit.

The sesamoids beneath the great toe—which are nearly always present—are two in number, one in each head of the flexor brevis hallucis, and opposite the metatarso-phalangeal joints. Their deep surfaces form a part of the articular surface of this joint and have at this place an articular membrane.

It will be seen that fractures of one of these bones, if not properly treated, would be likely to cause serious and long-standing impairment of the joint, the good functioning of which is of well-recognized importance to the soldier.

Where X-ray facilities are practicable, the condition should not go unrecognized, although some care must be had in reporting a fracture, as the tibial sesamoid bone of the great toe is sometimes congenitally in two or three pieces. When this diagnostic aid is not available, the condition should be borne in mind for, in spite of its apparent rarity, fracture of these bones can exist without any marked physical signs and still be a real cause of disability, extending over a period of months.

INSTRUMENTS AND APPLIANCES

RECOMMENDATIONS REGARDING BALKAN FRAME

By Major ETHAN F. BUTLER and Captain TIMOTHY F. X. SULLIVAN
Medical Corps, United States Army

(With seven illustrations)

Experience with the Balkan frame adopted for use by the Medical Department of the United States Army has pointed out several minor defects and shortcomings in the present standardized frame. The experience with this frame extends over the past fourteen months, and was gained at the War Demonstration Hospital, Rockefeller Institute, New York City (whence came the original plans of the frame), and at Bellevue Hospital, New York City, in connection with the course of instruction for medical officers under the direction of Maj. John A. Hartwell, M. C., U. S. Army. In this course extensive use has been made of the frame for teaching and clinical purposes.

The present standardized frame (Figs. 1 and 7) allows of great latitude in suspension, abduction or adduction of the lower extremity, but does not give a sufficient latitude in handling the upper extremity. Not infrequently cases are received with a lesion of the upper half of the arm or of the shoulder joint requiring treatment in abduction and, for one reason or another, rest in bed. With slight modifications (Figs. 2, 3 and 4) the standard frame could be made much more serviceable for these cases.

The present standard frame is fully described in Forms 117 and 118, "Inspection of Material for the Medical Department, U. S. A., Medical Supply Depot, New York City," and also by a blueprint working drawing without other designating mark than "Directions for Erecting Balkan Frame" (Fig. 7). It consists of fifteen wooden elements held together by bolts. In Fig. 1 these elements have been numbered to correspond with their designating numbers on the blueprint, and in referring to them the terminology of Form 117 is adhered to.

They are: 1, 2, long top bars; 3, 4, 5, 6, end upright pieces; 7, 8, bottom cross pieces; 9, extra cross piece; 10, 11, 12, 13, top cross pieces; 14, bottle holder; 16, trolley. (In the blueprint No. 15 represents 8 yards of cotton cord.) The essential additional hardware is enumerated in Form 118.

The suggested modifications involve elements 5, 6 and 9, the addition of one "extra cross piece," and the addition of three swivel pulleys (similar to those issued with the standard Hodgen splint) to the accessories.

In consulting Fig. 1 and Form 117, it will be noticed that two of the uprights (3 and 4) are slotted, on the flat side, for a distance of 34 inches—from the spring level of the ordinary high hospital bed to within 6 inches of the top cross bars. Of the other two uprights (5 and 6), one is not slotted at all, and one for only 20 inches. The "extra cross bar" cannot be effectively used at the end of the frame where element 5 (the unslotted upright) is employed. Loss of time is also occasioned in setting up the frame by the fact that the four uprights are not freely interchangeable. If all four uprights were made to conform to the specifications for the long slotted uprights, uniformity would be obtained with increased adaptability of the frame as a whole.

In the present standardized frame only one "extra cross piece" is supplied. An additional "extra cross piece" is needed when employing the frame for shoulder abduction as shown in Figs. 2, 3 and 4.

The patient can easily nullify traction unless the frame be carried at least 15 inches clear of the side of the bed. To carry it out for that distance it is necessary to have "extra cross pieces" at each end of the bed to support the "long top bar" in its new position. This "long top bar" must also be held firmly in position. Tying with muslin bandage is a makeshift that will serve the purpose if no better means are at hand. The best method for fastening the "long top bar" to the "extra cross pieces" is by bolt, similar to the other fastenings of the frame. The present dimensions of the "extra cross piece" should be changed in order to make this bolting possible. It is now made of 2¼ inch by 13-16 inch material. It would be advisable to employ 1¾ inch by 1 inch material, as in the "long top bars"; this will permit boring a hole on the thick side of the element, near each end, capable of taking the long bolt which already forms a definite part of the outfit (Fig. 6). In length it may remain unchanged.

In the present standardized frame several screw pulleys are arbitrarily fastened in position on the frame. All but two are concerned with the trolley for suspending the leg and call for no comment. Two are immovably placed on elements of the frame, where they will be most serviceable for the average case. However, it would be better to have three detachable swivel pulleys instead of two fixed screw pulleys. In the experience at Bellevue Hospital it has been found that the use of swivel pulleys, which may be easily fastened at the optimum point, greatly added to the clinical value of the frame. The swivel pulleys may be tied on by a "clove hitch," or metal bands may be used (Fig. 5).

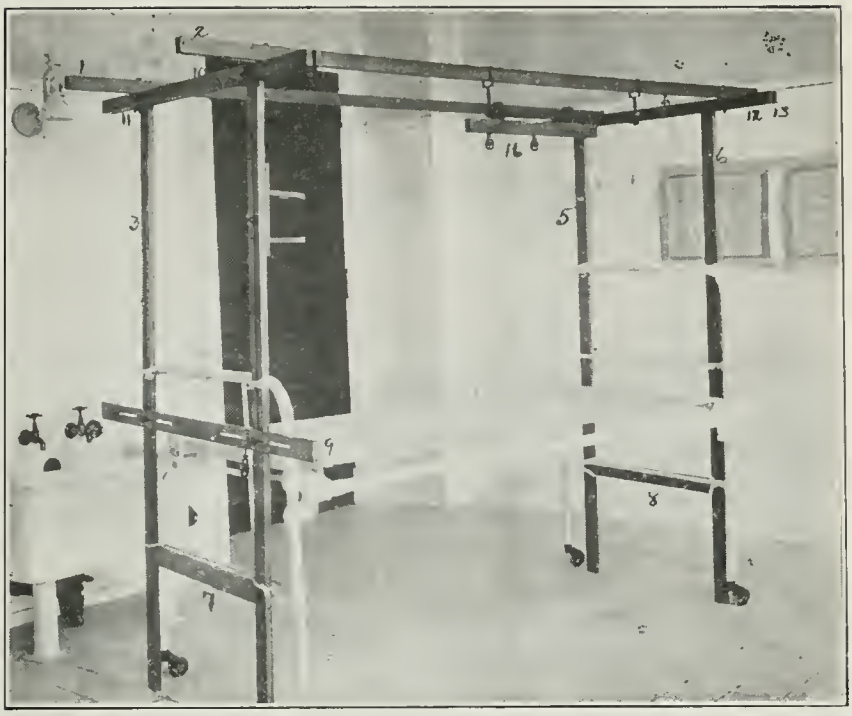


Fig 1.—The Present Standardized "Balkan Frame."

1, 2, long top bars; 3, 4, 5, 6, end upright pieces; 7, 8, bottom cross pieces; 9, extra cross piece; 10, 11, 12, 13, top cross pieces; 14, bottle holder; 16, trolley.

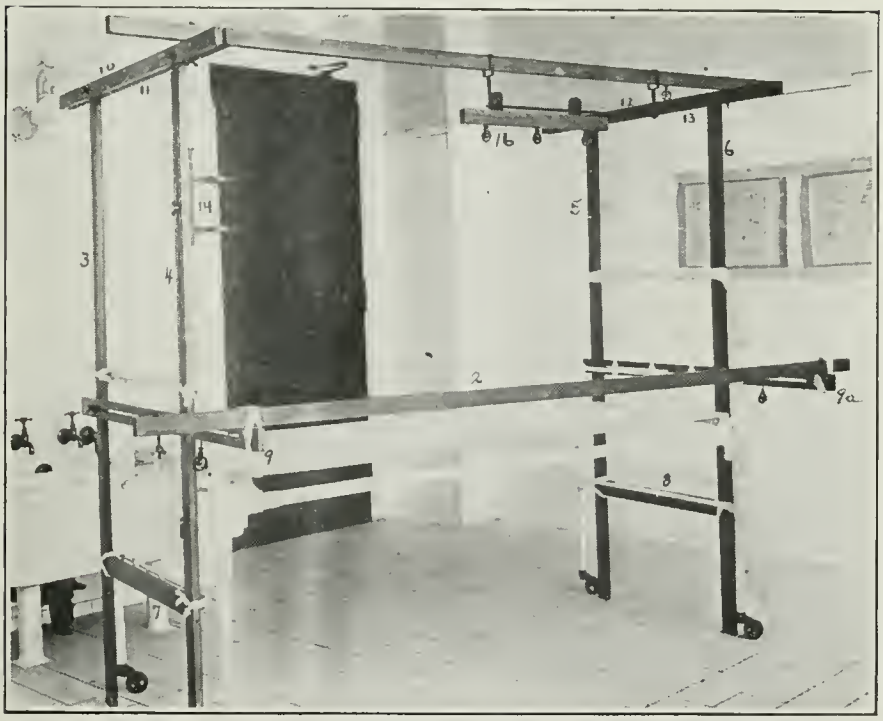


Fig. 2.—Suggested Arrangement of Balkan Frame to Meet the Requirements of Arm Abduction and Extension: "Long Top Bar" in New Position Supported by Two "Extra Cross Pieces."

1, 2, long top bars; 3, 4, 5, 6, end upright pieces; 7, 8, bottom cross pieces; 9, 9*a*, extra cross pieces; 10, 11, 12, 13, top cross pieces; 14, bottle holder; 16, trolley.

(To face page 207)

Fig. 3.—Clinical Application of Modified Balkan Frame to Patient with Abduction and Extension of Arm.

Fig. 4.—Clinical Application of Modified Balkan Frame to Patient with Abduction and Extension of Arm.

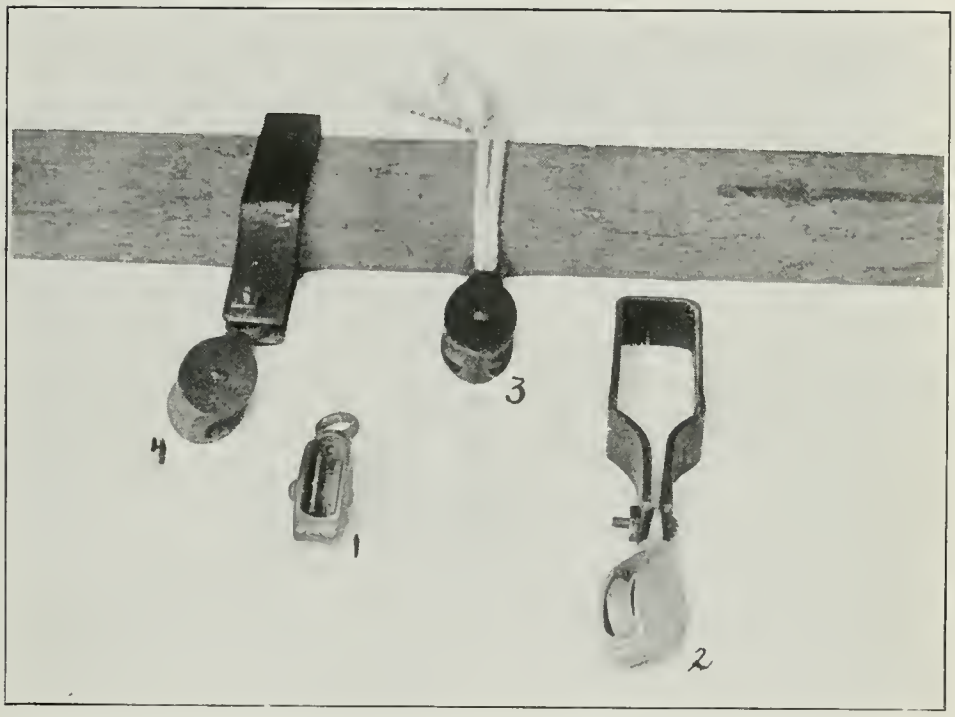


FIG. 5.—SWIVEL PULLEYS.

1, 2, individual pulleys; 3, pulleys fastened to bar by "clove hitch"; 4, pulleys fastened to bar by metal band.

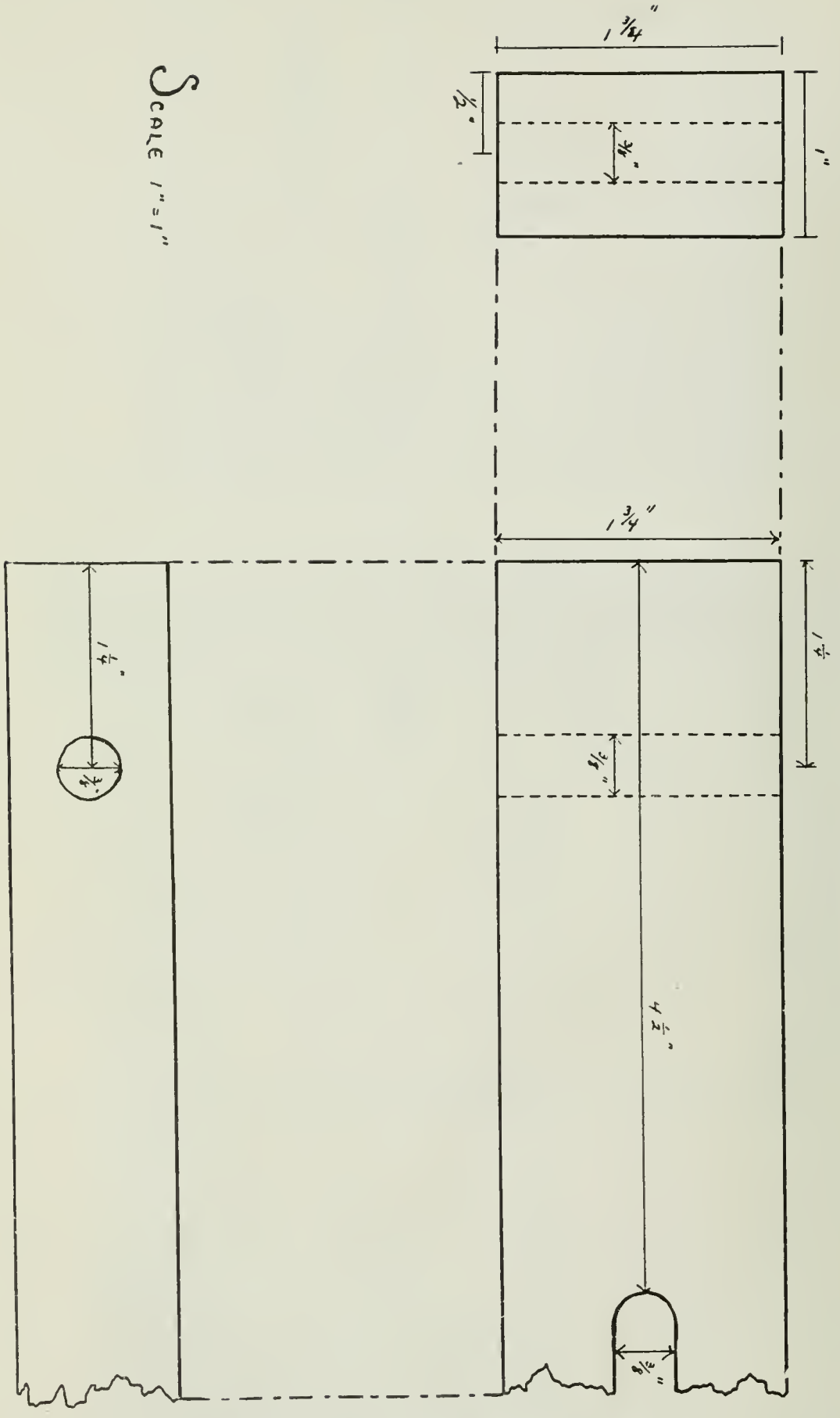


FIG. 6.—WORKING DRAWING SHOWING NECESSARY MODIFICATIONS IN REGARD TO DIMENSIONS, AND HOLE FOR BOLT IN THE "EXTRA CROSS PIECES."

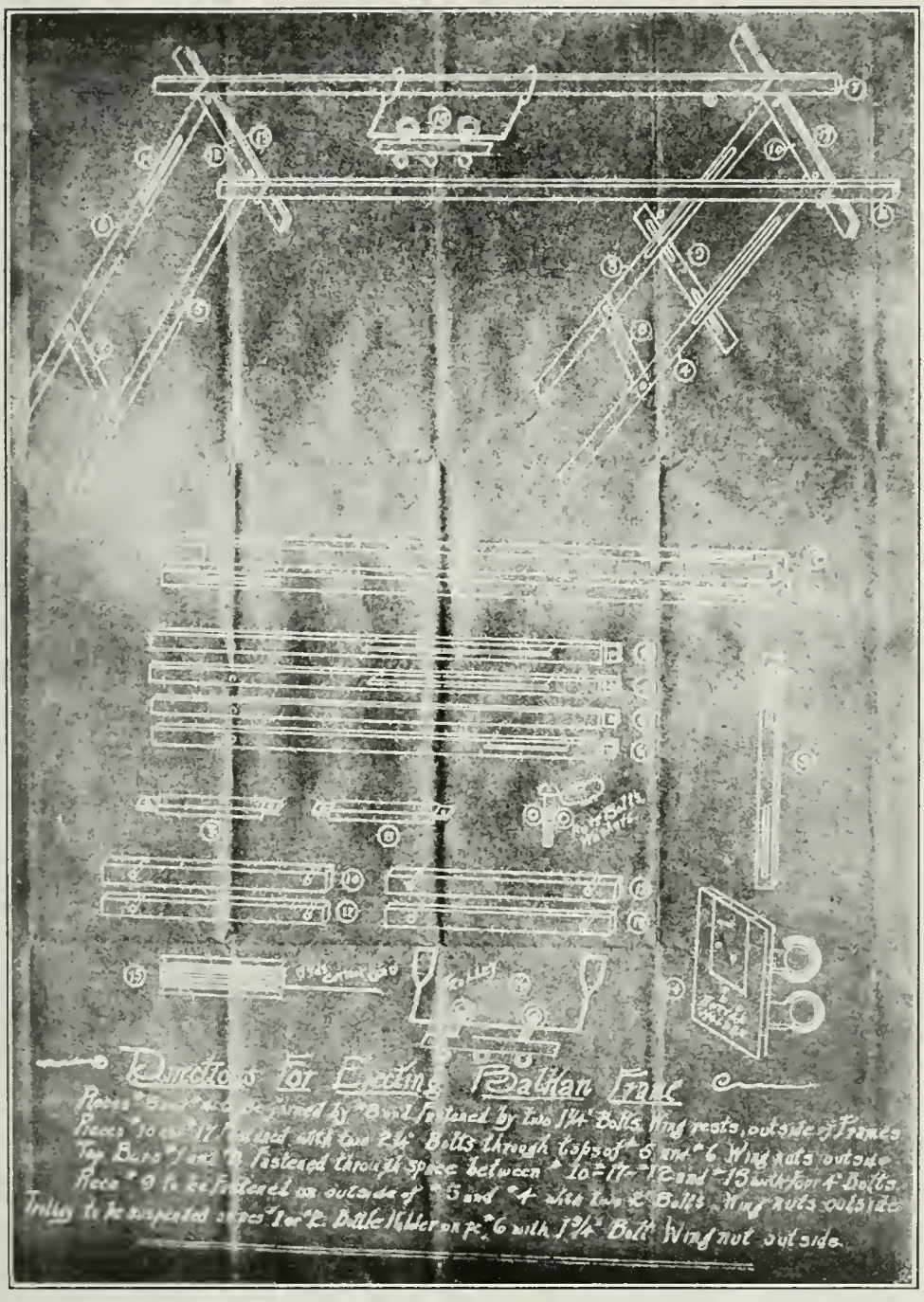


Fig. 7.—Photographic Reproduction of Blue-print Working Drawings of Present Standardized Balkan Frame.

To increase the usefulness of the frame, and to simplify its construction and erection, it is therefore recommended:

1. That all four "end upright pieces" be constructed according to one plan, giving maximum length of slot, as in elements 3 and 4.

2. That two "extra cross bars," instead of one, be furnished with each frame, to be 49½ inches by 1¾ inches by 1 inch, slotted as called for in element 9, and perforated as shown in Fig. 6.

3. That the two screw pulleys now fastened to the "extra cross bar" and "long top bar" be eliminated and three swivel pulleys of equivalent size be substituted.

Form No. 117.

Inspection Report No.
U. S. Appraiser
Port of

INSPECTION OF MATERIAL FOR THE MEDICAL DEPARTMENT, U. S. A.,
MEDICAL SUPPLY DEPOT, N. Y. C.

Inspection at Date

Specifications for Balkan Frame

Contractor Cont. Date No.
Manufacturer

Inspection by
U. S. Appraiser

Material: Maple or Birch.

Construction.—Two long top bars 99″ long by 1¾″ deep by 1″ thick. Slot cut in each end of bars 9¾″ long by ⅜″ wide by 1¾″ deep. This slot to be 2″ from end of bar. 1 screw pulley set in thick side of one bar 23″ from end.

Top cross bars. There are four of these, 2 for each end, and are as follows: 49″ long by 1¾″ deep by 13/16″ thick. 2 holes in center of deep part of each cross rod 11⅝″ to center of hole from each end ⅜″ diameter. End upright pieces. Four 76¾″ long by 2¼″ wide by ⅞″ thick. Top end of pieces shouldered to ⅜″ thickness and 1¾″ deep, ⅜″ hole bored through center of flat side of shoulder. One piece for head of frame slotted on flat side 20″ long by ⅜″ wide end of slot 48″ from bottom. 2 pieces for foot end of frame slotted on flat side 34″ long by ⅜″ wide 35″ from bottom end. Head and foot pieces made into 2 frames by cross bars mitered into same 17″ from bottom. Size of cross bars 28½″ by 2¼″ by ⅞″. Size of miter ⅜″ by 2¼″, one across bar to each end. Hole ⅜″ diameter through center of miter and shoulder. Inside width of end frames 2′0″. Extra cross pieces, 49½″ long by 2¼″ wide by 13/16″ thick. 2 slots cut in center of flat side 15″ long by ⅜″ wide, 4½″ from each end. Screw pulley set in top thick side 2½″ from end.

Bottle Holder.—Frame 10⅜″ long by 2⅛″ wide, ½″ thick. Bevelled slide fitted in top of frame 4⅞″ long by ⅞″ top by 1⅛″ bottom. Wood peg set in back slide ½″ long by 5/16″ wide 1″ from top of slide, ⅜″ hole in center of frame 4″ from bottom. Two shelves for holding bottle attached to bottle frame by four screws 1″ No. 8. Lower shelf 4″ from bottom, 4″ wide by 5″ long, 2½″ hole in center of shelf. Front of shelf cut away to hole ½″ wide. Upper shelf fastened to slide in top of frame. Shelf 4″ wide by 5″ long. Hole in center 1¾″. ¼″ by ¼″ piece

on top face of frame for bottle holder to keep slide in place, fastened to frame on each side of slide by two small wire nails.

Trolley for Bottle Holder.—Flat iron bent to form two holders to trolley, steel bar held by these two holders. Pulleys in frames suspended from steel bar. Frames for pulleys fastened to wood bar 23″ long by 1¾″ wide by 1″ thick. Pulley frames fastened 4¾″ from each end on thick side of bar. Three screw pulleys on thick side of bar underneath, one in center and one 4″ from each end.

Form No. 118. U. S. Appraiser
Inspection Report No. Port of

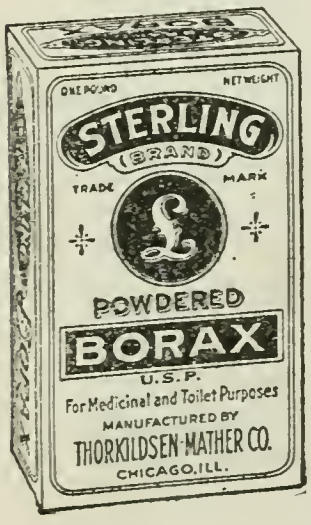
INSPECTION OF MATERIAL FOR THE MEDICAL DEPARTMENT, U. S. A.
MEDICAL SUPPLY DEPOT, N. Y. C.

Inspection at Date

Specifications for Hardware for Balkan Frame

Contractor Cont. Date No.
Manufacturer Inspection by
U. S. Appraiser

2—17″ by ½″ by 5/32″ flat iron.
4—⅜″ rivets ⅛″ thick round head.
2—Set screws ¼″ by No. 8 round head.
1—Steel rod 29″ by ⅜″.
3—1 ⅜″ screw shanked pulleys.
2—1 ⅝″ screw shanked pulleys.
2—1¾″ by ½″ pulleys in iron fittings, fittings to be 1½″ by 2¼″ by ⅞″. (Pulleys, rivets, and fittings separate.)
4—⅝″ screws No. 8 to fasten fittings to trolley.
4—1¼″ round head screw bolts 9/32.
4—22¼″ round head screw bolts 9/32.
4—4″ round head screw bolts 9/32.
2—2″ round head screw bolts 9/32.
1—1¾″ round head screw bolts 9/32.
15—1½″ wing nuts to fit above.
30—⅞″ washers ⅜″ hole.
1—2″ eye pulley.
25 feet ¼″ 3 strand cotton rope.
1—Rubber screws tip ¾″.
4—1″ No. 8 screws to fasten bottle holder.



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THE
MILITARY SURGEON
VOL. XLIII MARCH NUMBER 9

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE DUTIES AND RESPONSIBILITIES OF A REGIMENTAL MEDICAL OFFICER

BY COLONEL G. CREE, C.B., C.M.G., A.M.S., D.D.M.S., *13th Corps*

THE British Army is organized on the basis of the battalion as the administrative unit, in place of the regiment as in our service. A regiment can have as many battalions as can be raised from the locality for which the regiment was named, and it is merely a term of sentiment rather than of utility; but the Royal Army Medical Corps has preserved the name and gives a first-aid station and its medical officer the meaning we give it in our service; they calling the battalion surgeon the regimental surgeon, and the battalion aid post the regimental aid post.

Each battalion has one medical officer, one lance corporal, and one private. The lance corporal is the orderly; the private drives the car for the medical equipment. These are not soldiers of the R. A. M. C., but are detailed from the battalion. There are also detailed from the battalion and placed under his command one non-commissioned officer and eight privates to act as a sanitary squad. They are trained in these duties by the medical officer and are not changed when once detailed. He has also one noncommissioned officer and four men for medical duties. These are R. A. M. C. men usually, but at present they are also detailed from the battalion. Their duties are strictly concerned with water, sterilization thereof, cleaning of the carts and their working efficiency.

The English brigade consists of four battalions. In addition to these there are 16 litter bearers, although in most organizations this has been increased to 32. These men are willingly detached for this duty by the commanding officer of the battalion, as it gives them someone in the trenches on whom they can depend when men are wounded. They are fighting men, carry arms, and do not wear the Red Cross, but have an armlet with the letters "A.B.," meaning stretcher-bearers. They are trained by the medical officer of the

battalion in first-aid work. Even with the 32 men assigned for litter-bearer duty some battalions have had 64 trained in order to provide a reserve to fill up in case of casualties among these men, which are just as numerous as they are in the infantry. The battalion surgeon in the British service is responsible to the division surgeon directly.

THE DUTIES OF A BATTALION MEDICAL OFFICER

1. *Medical.*—A mere doctor is a small man in the army. Pills are not important; common-sense and all the qualities of a man are. He must be a medical officer and must act for the benefit of the state as well as the patient, and differentiate between a slacker and a sick man. In order to do this he must know the man, and in order to know him he must get his confidence and be in sympathy with him. The men are no more in sympathy with a slacker than he is.

2. *Sanitary.*—In teaching sanitation we must remember a regimental medical officer must teach it to every man in the battalion, from the commanding officer down to the last private, and in order to enlist interest in sanitation, intelligent men should be given a reason for rules. While the writing of letters is deprecated, a medical officer should always make notes of what is recommended to the commanding officer and when he does it, and after calling his attention to it three times without effect he should go over his head. Sanitation begins with the lowest unit, the company. In the English army we are teaching them that the company commander and not the medical officer is responsible. The medical officer is the sanitary adviser of the battalion commander. If the battalion commander gives a sanitary order the surgeon's responsibility ceases, except that he should see whether the order is being carried out and report. Every battalion has a book in which sanitary orders are noted. This book is kept by the medical officer. The sanitary squad of eight is apportioned at the rate of two to a company for practical sanitation. All latrines are visited daily; all ablution benches, all dumps, and all incinerators are supervised. The medical officer instructs in sanitation. He lectures the officers and men of the line on this subject, and this is one of his most important duties. In the broadest sense sanitation means the science of living correctly, and much can be secured by giving the men as much comfort as possible. The battalion doctor must watch over the comfort of his men. He must not be a scrim-shanker; he must do his work thoroughly.

3. *Constructive.*—The medical officer must provide a dugout for his battalion aid station. It ought to be at least 15 feet square and in the immediate vicinity of battalion headquarters, not only to permit him to use the telephone and be in contact with the commander, but because every one knows where the battalion headquarters is and thus will be able to find the surgeon. In this dugout there must not be too much truck—a supply for only a few days—bandages, dressings, drugs, and a few instruments, besides the usual complement of blankets and litters. There must be another dugout provided for the litter-bearers. It must always be borne in mind that the wounded may have to wait here some time before they can be transported to the rear. These posts are usually from 600 to 1500 yards from the front line trench. As to the capacity of the dugout, at least four litter cases should be accommodated at a time, and arrangements must be made to hold sick call there. It must be lighted, heated and at least rudely furnished with the necessary tables and benches.

During action the proper place of the medical officer is at the regimental aid station, where he should stay. The tendency used to be for him to go up and see his wounded in the trenches, but this has become too costly for the British army to stand, and is unreasonable inasmuch as he can do nothing there anyhow except expose the army to the loss of a doctor and deprive his organization of the only one they have at the time. Even if he could do anything in the trench, it would be only for one man, while a dozen might claim his attention back at his post and need it just as badly; so, every time he leaves his regimental aid station, he is lost to his particular command except that small portion he may attend. He must not leave his post but must stay exactly where it is, and wounded must be brought to him. It is for this purpose that 16 stretcher-bearers are furnished him. The carrying of wounded men in the trenches is the most laborious work known for two men, and they cannot do it often in a single day. Every field ambulance has a bearer division and a tent division, the first corresponding to our ambulance company, the second to our field hospital. It is the bearer division that is established nearest the regimental aid station. From the regimental aid station men are carried to the advance dressing station by R. A. M. C. men of this bearer section. Litter-bearers during an engagement are told off from the advance dressing station to reinforce the medical officer of the battalion, but they do not usually go farther forward than the

regimental post, which is from 600 to 1,500 yards from the line. Through them the regimental surgeon acquaints himself with what is going on at the ambulance head, from 2,000 to 8,000 yards in the rear of the first line, and at the front through the regimental stretcher-bearers. This advance dressing station may be in the open, although it is generally in dugouts. As from the first line trenches clear to the ambulance head men are littered back, it is well to have relay posts provided when the distance is long, especially between the regimental aid post and the advance dressing station. At Passchendaele it took six hours to reach the casualty clearing station. All of this transportation had to be done in the open and in the day time, as at night, men lost their way, and completely exhausted, fell into shell holes and were drowned. All evacuation was done under severe shell fire. At the battle of the Somme it took four hours to get back. The medical officer of a regiment, in an attack, goes over the top with his battalion commander. The Canadians told their commanding officers to bring their wounded to the aid station; they would take care of them from then on.

4. *Supervision.*—The regimental medical officer is the show horse by which the corps is judged. He must be tactful, show ability, and enjoy good fellowship with men without losing his personal dignity. He must be an example to his men—honorable, brave and upright. Above all he should be sympathetic and secure the full confidence of the men. He should be a leader in social, moral and military matters which affect his part of the military hierarchy. The English have the very highest possible respect for the regimental medical officer, and it is the regimental medical officer who is more than all others in a position to do that for sick and wounded which will determine the outcome of their wounds or their malady.

AN IMPROVED CUBICLE ARRANGEMENT

By Captain W. C. MABRY, M.C., U.S.A.
Medical Service, Base Hospital, Camp Lewis, Washington

(With twelve illustrations)

I. PREVAILING WARD ARRANGEMENT

THE prevailing arrangement of beds in the wards of this military hospital is as follows: Within the ward there are two rows of beds, the heads toward the side walls, the feet toward a center aisle. (Fig. 1.) On the porch, the heads are toward the wall, feet toward a narrow aisle next to the screened open-weather side.

Upon entering such a ward the long rows of beds with their occupants are instantly visible; at night, when lights are turned on, one has a view of patients in all stages of exposure. At any time patients can see all those who enter the ward and are themselves beheld. Activities connected with care of patients (unless laboriously screened off), arrival of new patients, removal of cadavers, etc., are matters of common knowledge and comment. In case infectious diseases occur in the ward exposure and cross infections necessarily occur.

The addition of a sheet hung along one side of the beds, the cubicle system, secures a vast improvement in these particulars, but does not remove the objectionable features. (Fig. 2.) Along the sides of the wards, at short intervals, the steam coils, radiators of the heating system are placed, likewise the windows so necessary for ventilation. The heads of practically all beds in the ward are very close to radiators and windows, and patients are unpleasantly and dangerously subjected to the heat and draughts thereby created. Colds followed by pneumonia, headache, and sleeplessness have resulted in this way. The sheets of the cubicles rather serve to emphasize these discomforts by creating new channels for draughts, preventing diffuse ventilation. The lights of the wards are strung along the center-line of the ceiling, shining directly into the eyes of the patients and awaking the sick at night when lights are turned on, a frequent necessity. Patients, as a rule, cannot see out of the windows; their view is obstructed by the cubicle sheets. An orderly or nurse responding to a call to any cubicle has to walk, in addition to the distance to the bed, twice the length of the bed, and has no means of locating a call except by hearing and hunting. Direct vision and inspection are precluded by the sheets.

A ward arranged as here described, with proper care for uniformity, presents a very neat and pleasing appearance.

II. CHANGE IN WARD ARRANGEMENT

In Ward 41 (Pneumonia), Base Hospital, Camp Lewis, Wash., on October 1, 1916, the conditions noted in Section I were exemplified. They were not satisfactory. Study directed toward a remedy resulted in a plan which, with the consent of the Chief of the Medical Service, was put in operation. (Figs. 3 to 7.) Briefly described, the plan is as follows:

1. Beds were reversed in position, heads instead of feet toward the aisle.

2. Cubicles (sheets used lengthwise) were shifted to include the head of the bed and 4 feet along the side next to ward entrance instead of along one side only.

3. Bedside tables, long dimension parallel to length of bed, were placed in the usual relative positions.

III. ARRANGEMENT OF PORCH

The porch, running the entire length of Ward 41, is utilized for beds, the heads of which are placed toward the side wall and the feet toward the screened open-weather side. This porch is approximately 10 feet wide; beds occupy 7 feet of this space. These beds cubicled (Figs. 8 to 11), as is usually the case, present practically no objectionable feature except as follows:

1. Draughts about heads of beds, from open windows, etc.

2. Difficulty of locating calls or movements made by patients because no direct vision or observation is possible.

3. Narrow corridors and total obscuration of patients by cubicle sheets. (Fig. 10.)

4. Extra distance walked by nurses and attendants in the care of patients.

Reversing of beds on the porch, as done in the ward, would have brought heads of patients too near the weather (rain, sunshine, etc.) and would prevent them from looking outdoors, a pirvilege all enjoy. No change was made, therefore, in this particular. The cubicle sheets were shifted, however, to conform with the arrangement already noted.

IV. COMMENT UPON IMPROVED ARRANGEMENT

Practical trial and use in Ward 41 of the plan herein described has so far provoked no single criticism or objection. Every patient,

officer or soldier, who has spoken of the change has done so with approval. Every nurse and attendant serving in the ward declares it to be labor-saving and more convenient than the former system. Many visitors, military and civilian (relatives of patients), have indorsed it heartily.

V. IMPROVED CUBICLE PLAN

Summary of advantages claimed for the improved cubicle plan described in this report.

1. No disadvantages have been discovered to date.

2. No additional materials required, no added cost of construction or maintenance in money or labor.

3. It saves 10 per cent of time and effort of nurses and attendants; *e. g.,* an orderly desires to fill water glasses on all bedside tables. Old plan: He walks twice the length of the ward (240 feet), and twice the length (5 feet) of each bed (30 beds, a distance of 300 feet) a total of 540 feet. New plan: He walks twice the length of the ward, stopping at the head of each bed, a distance of 240 feet, saving 56 per cent in walking.

4. Patients receive more prompt attention: (*a*) Nurse or orderly hears at night a noise which leads to the supposition that a delirious patient is getting out of bed. Old plan: Proceeds down the aisle looking to right and left until patient is found. New plan: Orderly at his station can see into head of each cubicle in his section (half a ward) or, by stepping rapidly to the clear space along either wall, instantly sees what is going on along the entire length of the ward. (Figs. 3, 4, 5, 8, 9.) (*b*) An orderly hears a call for service. Old plan: Hunts for it. New plan: Looks up, sees a raised hand, goes at once to the patient.

5. The cubicle thus formed is three-sided instead of two-sided and, theoretically, has more efficacy.

6. The cubicle is practically a private room. No patient can see any other patient. He cannot see anything which goes on in the ward such as toilet processes, the arrival of new patients, the demise and removal of others. He sees no visitors, except those conducted to his cubicle. The patient's head is amply protected from lights at night, from window draughts, and hot radiators. His feet are next to the heat, where they belong. He can look out of the windows upon the trees and sunshine. In case special seclusion is desired, a sheet hung between the heads of two beds entirely screens the cubicle.

7. Visitors entering the ward can see no patients. Coming out, their view is limited to fleeting glimpses of one side or the other only.

8. Ventilation is more evenly and thoroughly provided by open section next to wall, draughts are practically eliminated, and with windows open at the top there is circulation of warmed air.

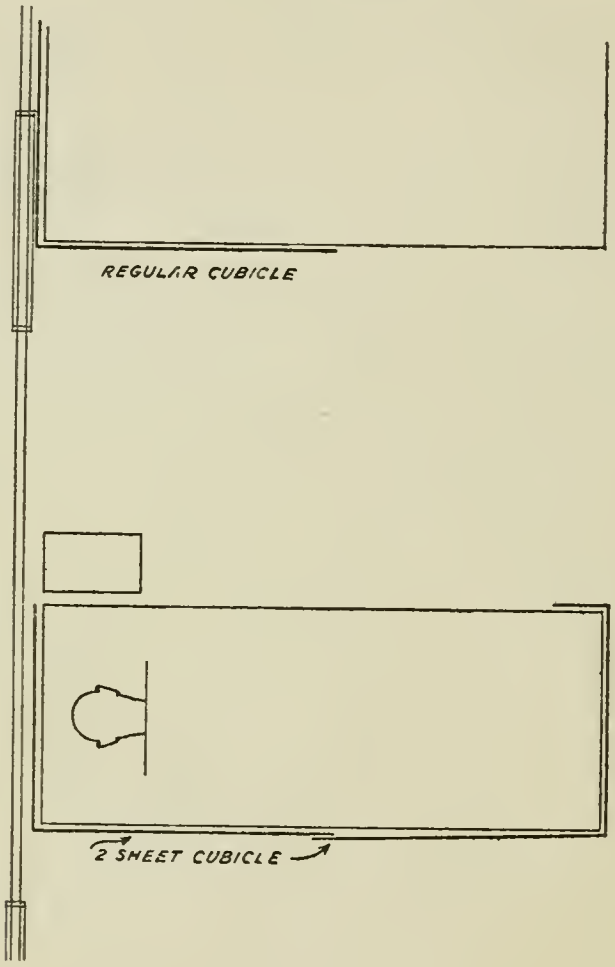


Fig. 11.

9. On the more exposed porch the protection of the head afforded by this cubicle system is typically exemplified. Intelligent patients are enthusiastic about it, especially because of the additional protection made possible on cold, wet, windy nights by running a second sheet along the remaining length and about the foot of the bed. (Fig. 11.) So arranged, it practically forms a tent. In very inclement weather the entire cubicle, as described in this section, may be made of blankets.

VI. SUGGESTIONS

1. In case this plan meets with favor, cubicle cloths of material slightly heavier or stronger than sheeting could be made with tie

FIG. 1.—The usual appearance of a ward without cubicles as described in Section I, showing the relation existing between ward beds, heads of patients, radiators and windows.

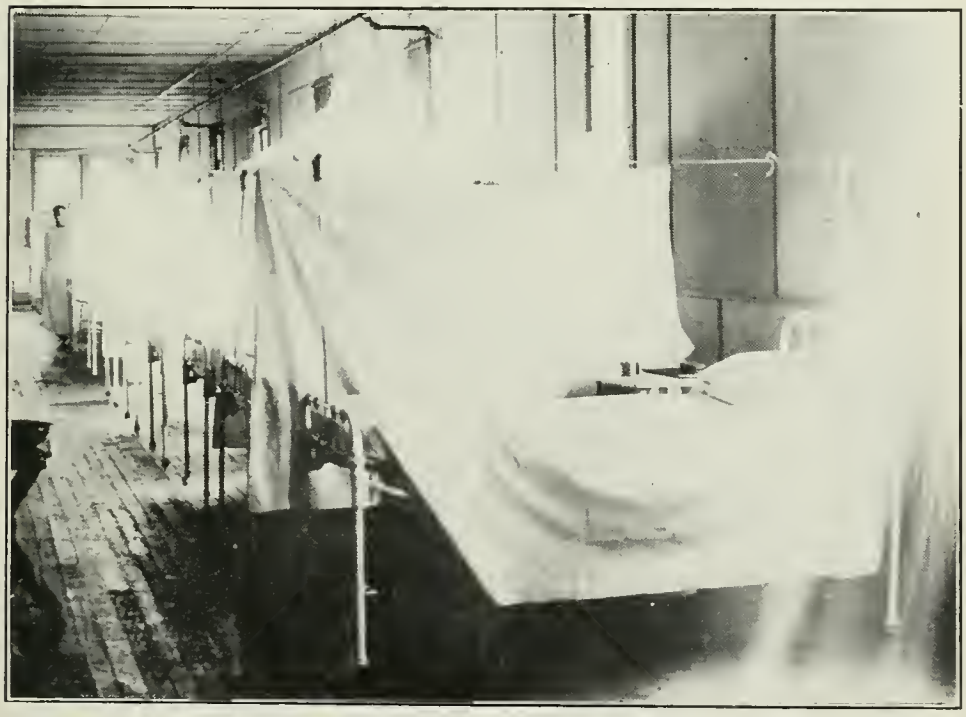


FIG. 2.—The usual appearance of a ward with cubicles as described in Section I. The cubicle sheet of the first bed removed to show relative position of patients' heads to radiators and windows.

(To face page 226.)

FIG. 3.—Appearance from entrance of Ward 41, Base Hospital, Camp Lewis, Wash., arranged as described in Section II.

FIG. 4.—Appearance from lower end of ward, arranged as described in Section II.

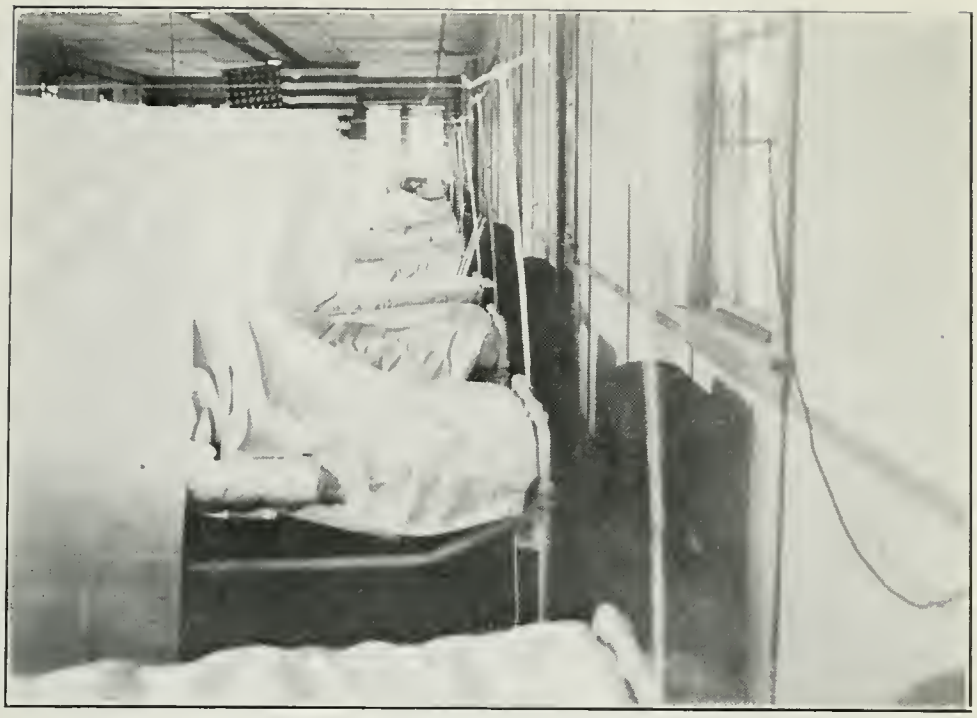


FIG. 5.—View along wall showing ventilation and observation space, the foot of beds in relation to radiators and windows.

FIG. 6.—View of "Convalescent Space" in center of Ward 41, Base Hospital, Camp Lewis, Wash., arranged as described in Section II.

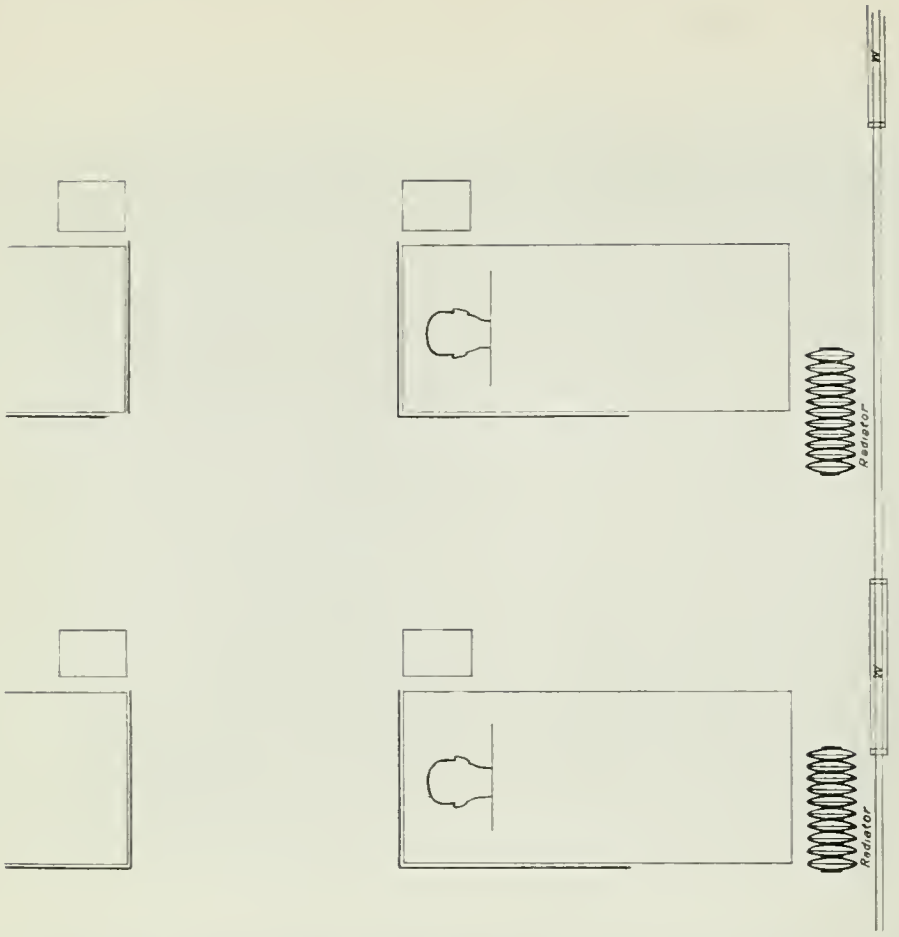


Fig. 7.—Ground plan showing position of cubicle sheets and cubicles as described in Section II.

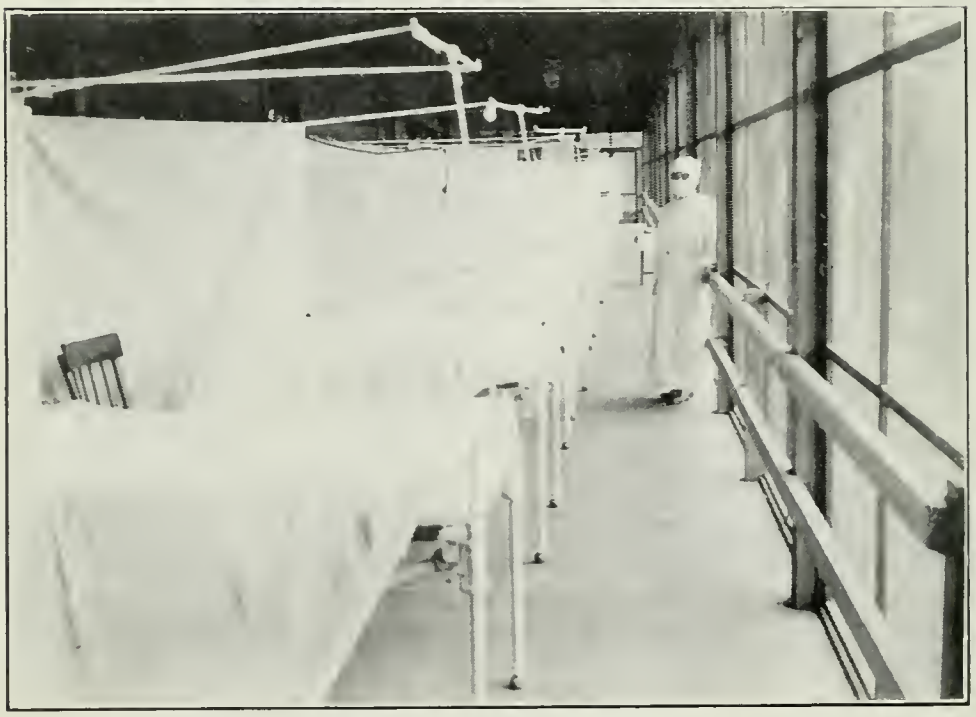


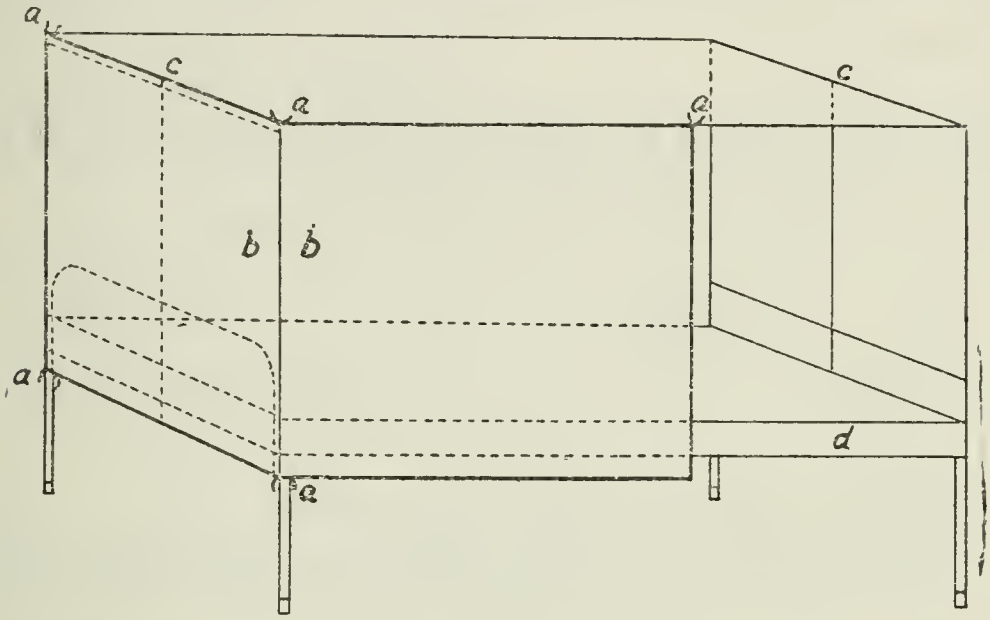
Fig. 8.—Appearance of porch from entrance of ward, arranged as described in Section III.

FIG. 9.—Appearance of porch from foot of ward, as described in Section III.

FIG. 10.—Appearance of a porch with side sheet cubicles.

strings at proper positions. Cubicle cloths about 42″ by 90″ with five ties would suffice. Such cloths would require about 30 per cent less material than sheets, they would cost no more, they would save time and labor in placing and much cost in maintenance. Sheets are easily torn by the pins used to hold them in place.

2. Colored materials also might be studied with a view to their use in various diseases and under special climatic conditions.



a — TIE STRINGS (5)
b — CUBICLE CLOTH
c — CUBICLE SUPPORTS
d — BED

FIG. 12.

EVACUATION SYSTEM FOR A BASE HOSPITAL

By Lieut. Colonel EUGENE S. KILGORE

Medical Corps, United States Army, American Expeditionary Forces

THE following is an outline of an evacuation system for a military hospital which has been found useful in meeting the ever pressing need in the Expeditionary Forces for disposing promptly of cases. Itis the product of the combined efforts of several members of our staff.

Every patient on entry to the hospital is supplied with an "evacuation slip" which is attached as the first sheet in his clinical history. A copy of this evacuation slip follows:

Date..... 19— Ward.....

.....

Rank (Surname) (No.) (Given name)

.....

Reg. or Dept. Admitted from

.....

(Diagnosis)

Disability did (did not) exist prior to service.

Disability is (is not) in line of duty.

Is recommended for action by Disability Board. Pending evacuation, he may be employed at (Heavy) work.
(Medium) work.
(Light) work.

Such as.....

In the opinion of the ward surgeon, this case is now suitable for:

(1) Psychoneurosis Center,
(2) "Mental Observation" Center,
(3) Orthopedic Center,
(4) Convalescent Camp,
(5) Distributing Depot as:
Class A (Duty at Front).
Class B-1 (Duty SOS, Temp., heavy).
Class B-2 (Duty SOS, Temp., light).
Class C-1 (Duty SOS, Perm., heavy).
Class C-2 (Duty SOS, Perm., light).
Class D (To U. S.)

If B or C, state any special qualifications for work.....

.....

If D, is wound healed?.....Is patient able to travel 48 hours without hospital train and without medical or surgical attention?.....

Ward Surgeon.....

Immediately on entrance to hospital the first three lines are filled out. The remainder of the form is completed when the patient is ready to leave. It will be seen that this information gives:

(*a*) The idea of the ward surgeon as to his classification.

(*b*) The kind of work he is fit to do in the meantime—and this also supplies the needed information on disability card as to kind of work suggested.

(*c*) The information necessary in regard to evacuation of "D" patients (to the United States).

In short, the slip contains all the information necessary for filling out the regular disability cards to be sent with the patient.

These slips (and with them the completed clinical histories of the patients who are proposed by the ward surgeon for discharge) are gathered daily by the orderly who collects the regular daily ward reports, diet slips, orders for laboratory and X-ray examinations, etc. The Disability Board sits at a specified hour each day, and all who have been proposed for discharge are ordered by the ward surgeon to report at this meeting. The noncommissioned officer in charge of evacuations meets these patients and separates them according to the classification proposed on their slips, *i. e.*, he gathers together all the "A" men and arranges their history cards in the same relative order as the men. He then introduces them one after the other to the Disability Board, presenting also the clinical history and the evacuation slip. If the board agrees with the classification proposed by the ward surgeon this is indicated on the disability slip; if not, the adverse decision is recorded.

After action by the board, the noncommissioned officer in charge of evacuations finds out the preparedness of the men for discharge as regards equipment; if a convoy is ready to be made up, he takes them immediately for issue of equipment, or he makes an appointment with them to report at the proper time for this issue. The date when patients are proposed for discharge by the ward surgeons is entered on the margin of the first sheet of the history (Form 55-A) by a rubber stamp. Similarly the record of the board action is recorded on the margin of 55-A by another rubber stamp. These entries make it possible to fix the responsibility in every case in which it is discovered that a patient has failed to be evacuated at the proper time.

In the case of patients whom the board has decided to evacuate, the evacuation slips are detached from the histories (which go back to their respective wards) and are sent to the office of the detach-

ment of patients. Many of these convalescents are employed in various parts of the hospital pending the time when they are classified and discharged. These slips serve to notify the office of the detachment of patients that the men are to be evacuated and that their places as guards, kitchen police, etc., have to be filled by finding other convalescents. If "B" cases (those not yet ready for duty at the front, but expected to be fit in a short time) are believed required for a certain time for work, authorization for their detention is obtained in writing on the disability slips from the commanding officer. Otherwise the slips go at once to the registrar's office and become the basis of the evacuation lists.

In order to enable the commanding officer to keep constantly in touch with the activity of the evacuation system the following chart is kept in his office and the figures are added to it daily by the orderly who collects the daily report.

EVACUATION REPORT

Month....., 19....

Proposals from wards.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ward 1.....															
Ward 2.....															
Etc.....															
Total.....															
Bd. Clas.[1].....															
Evac[2].....															

[1] Number of cases classified by the board.
[2] Number of cases evacuated from the hospital.

By reference to this chart one can detect immediately negligence on the part of any ward in the hospital in the matter of proper evacuations. This, therefore, forms a basis of inspections. A ward which shows a falling off in its rate of evacuation proposals is visited and the patients examined to see whether care has been exercised to propose for evacuation those who are fit. At the bottom of the chart one finds a check of the work of the disability board and on the last line a report of the actual evacuations from the hospital. By comparing the last three lines it is possible to locate readily any halting in the actual evacuation system.

As a matter of fact, it has been found advantageous in this hospital to make the bulk of the evacuations from certain buildings designated "convalescent buildings." Nursing and other facilities for caring for acute cases are therefore concentrated on the cases actually needing them, and when patients are able to be up and about they are transferred to the convalescent buildings. The convalescent buildings are managed without nurses and the members of the Disability Board are put in charge of these buildings as ward surgeons. This naturally greatly facilitates the work of the Disability Board, inasmuch as many of the cases that go through their hands have already been frequently examined and are well known to them. It is also a convenience to draw the necessary work details from a few convalescent buildings rather than from every ward in the hospital.

SERVING OF FOOD IN MILITARY HOSPITALS

By Major R. G. HOSKINS

Sanitary Corps, Section of Food and Nutrition, Medical Department, U. S. A.

FROM time to time there appear in the technical journals articles intended to show that this or that method of serving is greatly superior to any other. Sometimes one method is favored, sometimes another, but each has its enthusiastic champions. The problems involved in feeding sick soldiers are diverse, and the welfare and contentment of the patients depend to a considerable extent upon the methods used. It is thought, therefore, that a discussion based upon a comparative study of these problems in some thirty (base, general, post and aviation field) hospitals may be of some interest.

In the dining-rooms one of two types of serving is usually seen. In the so-called cafeteria system the patients form in line and pass along the serving counter, receive their food, and then go to the tables and eat it. The other plan is to serve the food in platters and dishes on the tables and allow the men to help themselves. A composite system is occasionally seen in which the bread, vegetables and beverages are placed on the tables and the meat and dessert are served to the men in line.

With the cafeteria system the patient himself does nearly all the work of serving and of cleaning the tables after the meal. Under emergency conditions, as in the late influenza epidemic, the mess personnel may be almost overwhelmed with the volume of work which they have to do; in such cases anything which saves work is important, but under ordinary conditions the advantages of the cafeteria line in this respect are not great. Another advantage claimed for the line service is that the amount of food dispensed to each man can be absolutely controlled. Theoretically, therefore, it is the most fair system and conducive to low wastage. As another advantage it is claimed that time can be saved—that a given organization can be fed in, say, seventeen minutes rather than in twenty-two, although it is not clear what value is to be attached to the five minutes saved. It is averred by some officers that order can be more easily preserved under the cafeteria plan. The writer has, however, been unable to see that this claim has any serious merit. With good discipline, good order is obtainable with almost any

system, and with slack discipline poor order is always seen, no matter what system of serving is used.

Finally, it is pointed out that fewer dishes are required to serve in line than at the tables. The cafeteria system thus saves a certain amount of expense in original equipment and breakage, although not a great deal. When platters and serving-dishes are used they have, of course, to be washed after each meal, and accordingly there is an increased amount of work to be done in the kitchen.

On the whole, comparing one hospital with another and one system with another, the disadvantages of the cafeteria system outweigh, in the opinion of the writer, any advantages it may have: while line service facilitates progress from the standpoint of the dining-room orderly, for the individual patient it is slow and tedious. He has to stand in a slowly moving line. When open porches are used, as in some of the Southern camps, he may be exposed to disagreeable weather for which he is not properly clothed.

Even when the lines form in closed corridors these are likely to be found cold and disagreeable. When the man reaches the serving counter he often has a promiscuous mixture piled upon his plate, with little regard to order or fitness. Cornbread, stewed tomatoes, gravy and beans mingle in a sorry conglomerate. Another disadvantage of the line system is that it is hard to keep the men who are serving from favoring their friends and penalizing their enemies.

Assuming that good food has been provided and properly cooked, then the method of serving plays the greatest part in encouraging or discouraging waste. In case the line system is used, alert, intelligent men should be placed in charge of the dispensing. They should not be allowed to forget that their efficiency is an important factor in the success of the service. Each man in the line, as he passes his plate, should decide for himself whether or not he has each dish served to him. In all cases, relatively small first helpings should be served, and the men who want more required to come back for "seconds." Bread should be cut in half-slices ½-inch thick, and the men should be given an option as to how many of these they are given. It would probably be better, whatever system of serving is used, to put the bread at least on the tables and allow the men to help themselves. One advantage of serving half-slices, which is sometimes overlooked, is that the men who want only a small amount are not compelled to eat a whole slice or do without.

The waste is just as great when a man overeats as when he empties food into the garbage can.

Having arranged that each man has a choice of what is served to him, another requisite in keeping down waste is to see that the "clean plate" rule is obeyed, that is, that every man eats all the food he takes. There are two ways of approaching this matter. The rule is easier to enforce when the men understand why it is necessary. Wasting food is a part of the education of all well-to-do Americans. The orthodox way of manifesting hospitality in the home is to encourage the guest to go as far as possible in ruining his digestion through over-eating. In many families it is even considered bad manners to leave the plates empty. Many soldiers bring this feeling into the army with them, and they instinctively resent what seems like petty stinginess. Officers have found it wise, therefore, to go carefully over the reasons why saving food is necessary, explaining not that money must be saved for the Government, but that the amount of food in the world is very much less than the amount needed and that which one man wastes someone else has literally to go without. It is probably not extravagant to say that every garbage can full of wasted food costs at least one human life. When the men understand this point very little difficulty usually occurs in regard to the "clean plate" rule. For cases in which explanations are insufficient, disciplinary measures of course remain. The simplest and most effective method is to place a good sergeant in charge of the dining-room and require him to see that all edible food is eaten. His methods are likely to be direct and 100 per cent efficient.

The matter of cream and sugar for beverages may here be discussed. On general principles it is advisable that these be placed on the tables and the men allowed to suit their tastes as to the quantities used. The actual consumption of sugar at any rate is probably somewhat higher by this method, although not greatly so. but stinting in the use of sugar is a poor method of economizing. Sick soldiers are a preferred class. Moreover, any restriction of sugar in the mess often results merely in higher canteen purchases of candy. Another phase of this problem, however, is that sugar may be left undissolved in the bottom of cups. In several instances sergeants who had successfully met the difficulty were questioned as to their method. They all gave essentially the same answer, "If they get to wasting sugar I take it off the table; when they find that waste will not be tolerated we have no trouble." An occa-

sional waster can best be dealt with individually. To avoid unsanitary practices it is advisable to use some sort of container from which sugar is poured instead of dipped. Such containers can be obtained from the hotel supply trade or can be improvised from baking-powder cans by cutting a hole ½-inch in diameter in one side near the top.

As to cream, if, as is usually the case, condensed milk is used, there is no legitimate objection to its free use in beverages. It would be better for the health of the patients to use at least 4 ounces of condensed milk or 8 ounces of fresh milk a day.

The most significant cause of food waste in many hospitals is one that is often hardly even suspected, that is, over-consumption of "concentrates." Such a meal, for example, as roast pork, mashed potatoes and gravy, lima beans and raisin pie, is, for a hospital patient, a very wasteful one. A man needing 2,000 to 2,500 calories may and often does eat 4,000. This excess is waste, in every sense of the word and, moreover, it is often harmful to the man himself. The proper method of controlling this sort of waste is to use intelligence in compiling the menus, to adapt the food to the actual needs of the individuals by reserving "concentrates" largely for the men at work, and for others using the various "extenders" such as the coarse vegetables and bulky foods. The cooks ordinarily need a special "post-graduate" course of instruction, however, in the preparation of vegetable dishes. Serving plain boiled turnips, for example, merely results in high garbage production for that meal.

The foregoing principles can be applied in theory and largely in practice to ward service. Every effort should be made to get the food to the wards in an attractive condition and then to get it to the patients without deterioration. Hot viands should be served *hot*, and cold viands *cold*. This does away at the start with an important cause of wastage. When to a patient whose appetite is capricious at best, an unattractive, lukewarm conglomerate of lumpy mashed potato, stewed tomato and hash is served, there will inevitably be a high amount of garbage. In many instances, when physical and sanitary conditions permit, it is best to take the food carts into the wards and serve each patient directly as is done, for example, at Camp Lee. The portions served at first should be small, such as the least hungry rather than the most hungry man is likely to want. These can be supplemented by "seconds" to any desired extent. The bread should be cut in half-slices, and together with cream, sugar, salt and pepper should be passed separately. Usually

there is nothing except ignorance and indolence to prevent a service so well adapted to individual patients that the edible waste drops to a low figure.

If the serving is properly done, the "clean plate" rule can be enforced nearly as well in the wards as in the dining-rooms. There is usually an abundance of help available in the persons of convalescent patients to perform this service. The waste of even a single slice of bread is indefensible, if it can be prevented by curtailing slightly the useless leisure of a ward attendant. It is usually advisable to have a supervisor of ward service; in some cases dietitians have been able to do this work admirably. Any serious defects encountered by the supervisor should be taken up with the surgeon, who is primarily responsible for ward conditions.

All left-overs should be kept clean and, except those from contagious wards, should be returned to the kitchens. Allowing the ward attendants or convalescent patients to stuff themselves with attractive left-overs after already having had all they wanted to eat of other foods is a fairly common practice, but one in which the involved waste is merely concealed.

In supplying food to the contagious wards special efforts should be made to send only such quantities as are going to be needed, since left-overs from these wards cannot be returned to the kitchen. Skillful efforts to develop a pride in their work of all concerned in nutritional matters go a long way toward keeping down waste and insuring good service. The waste from each ward and mess should be weighed separately and recorded, as is done in some of the best hospitals. This amount, reduced to a per capita basis, should then be reported. Considerable publicity should be given to the showing of each ward or mess and a spirit of rivalry stimulated. The person in charge of any group in which the waste is higher than the average, should be notified of that fact and urged to reduce it below the average. This procedure, if carried out for a few weeks, is very effective in lowering the general average. A small building, such as has been provided at Camp Custer, to be devoted to the inspection, separation and weighing of garbage, can be recommended.

Altogether there is probably no other one feature which serves so well as a criterion of the efficiency of the mess as does that of waste control. Any hospital in which the patients are reasonably well contented with their food, and where wastage is low, is almost invariably one in which the mess management is satisfactory throughout.

THE CAFETERIA SYSTEM OF HOSPITAL MESSING

By Major A. G. WILDE

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(With one illustration)

THAT the often maligned hospital mess is not always free from fault is at times demonstrable. The following have, as a rule, been the principal points of criticism:

1. The food is poorly cooked, being especially too greasy. Frying in deep fat is an easy method, and a kitchen force not under proper supervision will usually adopt it in preference to any other. The necessity for the conservation of fats at this time renders this practice doubly objectionable.

2. Little thought is given to tempting the appetite of the sick, which, as a rule, is rather capricious.

3. Too great monotony in the diets.

4. The food is prepared too early in order to allow the cooks off for the day and, by the time it is served, is cold, sodden or otherwise unattractive. A kitchen force left to its own initiative will serve its noon meal at eleven o'clock and supper at four, in order to get away as early as possible.

5. Preparation of too great quantity of food, with the inevitable waste. The men pile their plates full, eat a small portion, and handle or soil the remainder so as to render it unsuitable to serve again.

6. Lack of prompt attention on the part of waiters.

7. Unnecessary noise and confusion in the dining-rooms.

8. When the food is placed on the tables before meals, there ensues a scramble for the serving dishes on sitting down, in which the weak or timid are apt to fare badly.

In an endeavor to correct these abuses the cafeteria system was adopted, with such modifications as local conditions necessitated. The system was first tried at the Post Hospital, Corregidor, P. I., later at Base Hospital No. 5, Nogales, Arizona, and at present is used at the Camp Hospital, Douglas, Arizona.

When first adopted in 1916, the question of actual saving of food was a minor consideration, although it was desired to replenish a somewhat depleted hospital fund. Now, however, the importance of food conservation and the ease with which this can be accomplished render the cafeteria system not only desirable, but almost obligatory.

That this is adaptable to any locality or personnel is shown by its wide adoption. It is used mostly in the western states, where it is very popular; thousands are served daily in a manner at once orderly, expeditious and sanitary, and at a cost below what would be possible were it necessary to employ waiters and incur the other expenses incident to the old system.

It has been widely adopted in the Navy, where the results are favorably reported. In an article appearing in the *Modern Hospital* for December, 1917, Chadwick and Smith give their experience with "The Cafeteria System for Tuberculosis Patients." The following suggestive passages are quoted:

> The Board of Trustees approved of a trial of the plan, and in April, 1915, the necessary equipment was installed to care for the employees on the self-service basis. There was very little opposition to the change, and the few patients who objected going to the counter were soon won over by the obvious advantages that they were quick to perceive. The food was always hot, the service was rapid, and the opportunity for choice was greatly appreciated. . . . During the sixteen months it has been in operation no complaint of the food has been made; on the contrary the patients, realizing the prevailing high cost of supplies, have stated they do not see how we can provide so good a bill of fare. . . . It is an economical measure as well, because when good food is attractively displayed and the quantities served in proportions suitable to the individual, nearly if not all of it will be eaten and the waste reduced to the minimum. Moderate-sized portions are served, and the patients may come back for the second or third helpings if they desire. We want them to leave clean plates and therefore impress upon them the necessity for taking only as much as can be eaten. . . . A frequent complaint made in institutions is the lack of variety of food. The cafeteria plan solved this problem to the satisfaction of all. The individual sees the food displayed in a tempting manner; it is steaming hot and attractive; there are two or more kinds to choose from, and the variety appeals and satisfies.

The following description of the cafeteria system as at present operated at the Camp Hospital, Douglas, Arizona, is taken from the report of Lieut. Col. J. A. Baer, Inspector General's Department:

> The present commanding officer, Maj. Adna G. Wilde, M.C., took command of this hospital February 1, 1918. Prior to this time the system of seated service was used at the camp hospital mess for those convalescent patients well enough to walk from their wards to the mess hall. In this service the plates, knives, forks, spoons, etc., were placed on the table, and the serving dishes with food served in them were placed on the tables before the patients entered. Mess attendants then kept the serving dishes filled. Through a lack of supervision, those patients who entered the mess first would take the serving dishes, move them to their end of the table, and help themselves to the choice portions of the food before passing the dish to other patients sitting at the table. Therefore a scramble to get in

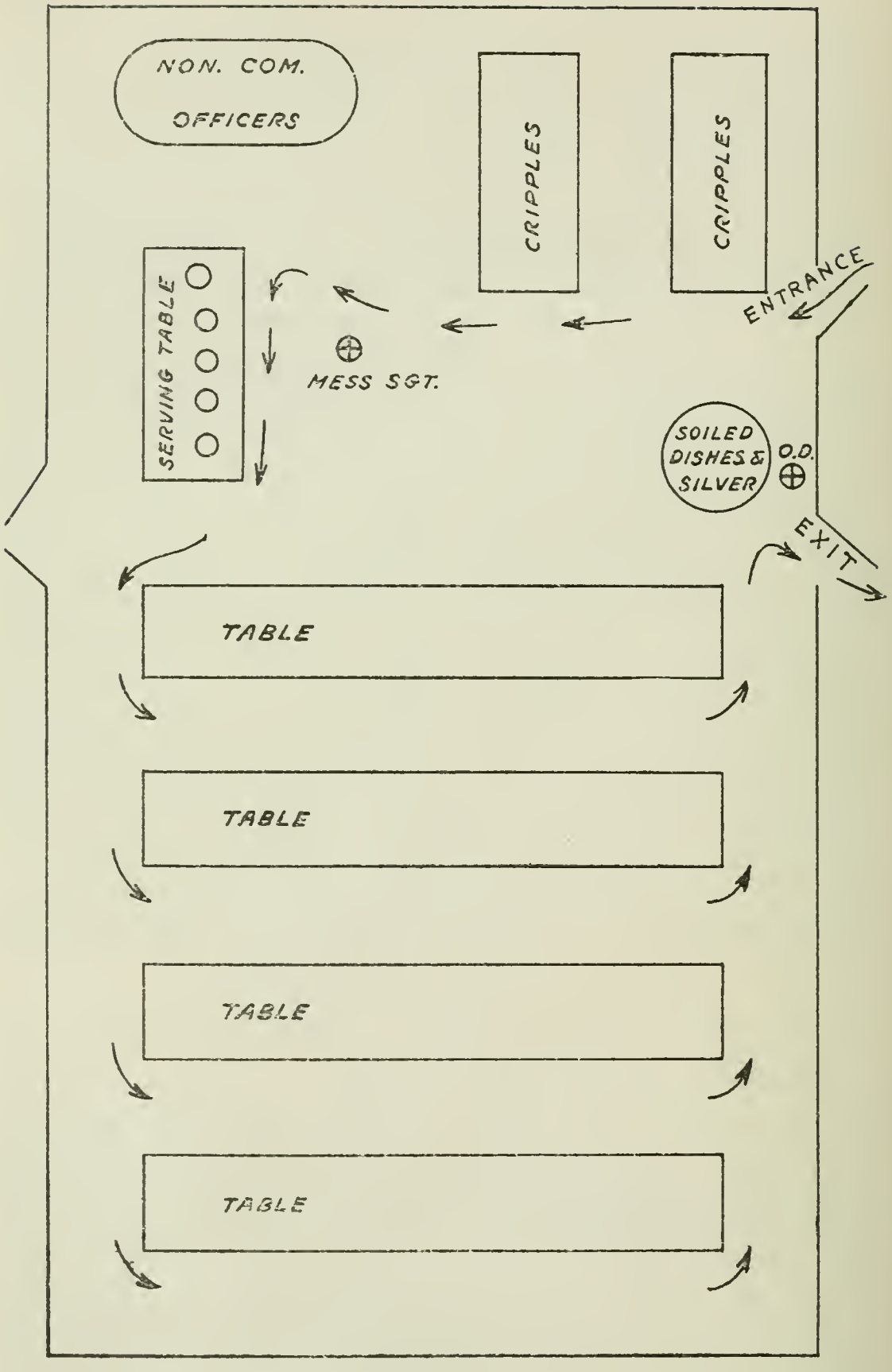
first resulted. Major Wilde abolished this, and started what he calls the "Cafeteria System." My visit to the hospital was entirely unexpected, and the meals I witnessed were therefore not special meals.

The patients were standing in file outside the door of the mess-room. There was no confusion and no noise. The tables were not set, but a pile of plates, knives, forks, spoons, etc., were stacked on a table near the door. The Officer of the Day was in the mess to supervise the service. Cooks who were in white aprons, or their assistants who are men of the Medical Department, were behind a serving table on which were large dishes or pans, each serving one article of the menu. In the corner of the room was a small table at which the noncommissioned officers of the detachment were eating. The members of the detachment were admitted first. They entered in column, one behind another, went to the table on which were piled the plates, knives, forks, spoons, etc., each taking whatever articles he wanted, and was at liberty to wipe the dishes he took in addition to their previous cleaning, and for which purpose clean towels were provided.

The men then passed the bread server, meat server, each of the vegetable servers, etc., and after each had received the portions he wanted, he passed to the farthest unoccupied table, sat down and ate his meal. After all had been served, anyone wishing additional food was allowed to return for a second or third helping, the only stipulation being that each had to eat all the food placed upon his plate, with the exception, of course, of those portions not edible. Consequently the men took small portions, but several of them. Each man, after finishing, piles his dishes on a table near the exit door, at which a noncommissioned officer checks up to see that he has eaten the portion he has asked for. This system, guarding against the waste of food by not serving too much on the plates, has made a saving of 35 per cent in rations. After members of the Medical Department had finished, the tables were washed, fresh serving dishes of hot food were brought in and the doors opened for the patients. First came the line of cripples, which consisted of patients on crutches or who were able to walk, but weak. After these men had been served and were seated at special tables, the doors were opened for the convalescent patients. I noticed no disorder, the meal was served hot, and there was no waste at the meals I witnessed, one of which I ate and found to be excellent.

The attached diagram shows the workings of the system even more plainly than a description:

When first taking charge of the mess at the Camp Hospital, Douglas, Arizona, February 1, 1918, the fund on hand amounted to $1,058.70. When the statement was submitted for the following August, the amount on hand was $5,105.43, or a saving of $4,046.73. During this time $656.50 was expended for durable property, making an actual saving of $4,703.23, or at the rate of $671.89 monthly. It may be added that the local market is quite expensive, even compared to modern prices elsewhere, as practically nothing is produced locally and high transportation charges are therefore added to the first cost.


NON. COM.
OFFICERS
CRIPPLES
CRIPPLES
ENTRANCE
SERVING TABLE
MESS SGT.
SOILED DISHES & SILVER
O.D.
EXIT
TABLE
TABLE
TABLE
TABLE

The report of Lieutenant Colonel Baer speaks of the saving of rations, an especially valuable feature of the system. The amount of garbage remaining after serving a meal to five hundred is surprisingly small. Waste is thus eliminated. During the period of the above savings, there was manifested an improvement not only in the cooking and general cleanliness of the kitchen and dining-rooms, but also a steady increase in both the quality and quantity of the rations served.

The menus are carefully prepared and submitted to the commanding officer for his approval. The meals themselves are inspected by the commanding officer, mess officer and Officer of the Day, the last remaining in the dining-room while they are being served. These inspections include sampling the various dishes in the presence of the chief cook and mess sergeant, and praising, suggesting changes or condemning as conditions may warrant. Such display of interest by those in authority filters down through all grades, so that it is now a matter of personal pride to the cooks that their dishes be spoken of approvingly.

At the beginning of the meal, as the men file by the serving table, everything is displayed, and they have the privilege of selecting not only the kind of foods but the amounts of each they receive. As they know the Officer of the Day is present to inspect plates at the end of the meal, and that everything edible must be eaten, they display a certain conservatism in judging quantity, preferring to return for additional helpings should their appetites warrant. At the termination of the meal, and just before filing out, plates are brought to a table near the door of exit at which is posted the Officer of the Day, and all scraps are placed in a receptacle for that purpose. Should any portion of food remain on the plate, the men are returned to the table to finish it.

If a hospital, or for that matter any organization, enjoys the reputation of providing an excellent mess, the personnel is not only more satisfied and renders better service, but the abundance of applicants for transfer permits a choice that ultimately raises the efficiency of the entire command.

In the management of a mess, constant watchfulness and supervision are obligatory, or the mess will fail of its purpose. This watchfulness must prevent the following: (1) Waste of food, (2) waste of money, (3) noise and confusion, (4) poor cooking, (5) inefficient service, (6) poor or monotonous menus, (7) loss of food or money through actual dishonesty on the part of the pur-

chasers, (8) sale of food by the kitchen force, (9) unauthorized use of food outside the mess, especially by married mess attendants.

The mess sergeant should be carefully selected and supervised, and all purchasing limited to him or the mess officer. All bills should be checked by the mess officer as the articles are placed in the store-room, the bills themselves preserved in the safe and checked against the monthly statement when this is rendered. The store-room should be safeguarded against unauthorized entrance, and it is preferable to have the mess sergeant's quarters immediately adjacent.

It has been found by experience that the night force is especially liable to consume excessive amounts of food, due entirely to a lack of supervision. This can be prevented only by placing the necessary night rations in a separate room or ice-box to which the night cook alone has access, and holding him liable for their proper utilization. It has also been found that, during the day, the large number of mess attendants and the heat from the ranges interfere not a little with the proper police of the kitchen. This can be obviated by having the police done during the night, as no delay or confusion is then caused thereby during the day.

ADVANCE SURGICAL FORMATIONS—MODIFICATIONS WHICH SEEM NECESSARY IN THE LIGHT OF THE GERMAN OFFENSIVE OF MARCH-JULY, 1918

By Major GEORGE DE TARNOWSKY
Medical Corps, United States Army

I. GENERAL CONSIDERATIONS

IN REVIEWING the military events of the past three months, it becomes manifest that the system in vogue prior to the offensive must be modified in order to meet the Medical Corps problems and demands incident to a war of movement. Prior to the offensive, the situation at the front, judged purely from a medical point of view, was the result of a growing belief in the impregnability of the lines.

Our allies, and particularly the French, pinned their faith to a few very large hospital centers—usually a combination of evacuation hospital and two or more mobile units (*auto-chirs*), with a total capacity varying between 1,500 and 3,000 beds. These large centers were situated from 8 to 15 miles from the front lines; the mobile units, as such, no longer existed, those in use having lost at least a part of their identity and forming part of the unit, with permanent barracks instead of mobile tents, and with permanent operating rooms instead of the demountable X-ray and operating rooms of the *auto-chir*.

II. NEW TYPE OF WARFARE

The present series of offensives differs from the preceding in two respects: In the first place, it is notorious that the Germans attacked the defenders and not the defenses. With the possible exception of the Cambrai affair of November, 1917, artillery preparation had always aimed at the destruction of defenses and only incidentally at the elimination of the defenders. By the use of enormous quantities of gas shells the Huns were able to place the defenders *hors de combat,* and advanced rapidly over ground which had not been previously levelled by artillery fire. The same use of gas shells along the lines of communications, prevented the prompt bringing up of reënforcements, so that on two, or even three occasions, open warfare pertained within a few hours after the beginning of the attack and continued as such for several days.

The second innovation which the Huns brought about was the use of large numbers of very light field guns of small caliber which could be dragged forward by the infantry itself. A new type of light machine gun also appeared, thus enabling the troops to advance rapidly without having to wait for their ordinary field artillery or heavy artillery to move up.

The unavoidable consequences of this rapid advance were either the total loss through capture or destruction, of the hospital centers nearest the front attacked, or the impossibility of those still remaining behind the allied lines to continue functionating during the battle, on account of the latter's uncertainties. A majority of the wounded who did not fall into the hands of the enemy had to be transported from 30 to 50 miles, by train or ambulance, before they could receive any surgical dressing other than first aid. This state of affairs lasted until the lines became stabilized and new trenches were dug. All of these facts are now public property and can, therefore, be freely written about. It has now been amply demonstrated that, no matter how many lines of trenches have been prepared in advance, if the defenders thereof are either gassed, wounded or killed, and the reserves are prevented from reinforcing the front trenches on account of powerful barrage fire of mixed gas and high explosive shells, the entire line will crumble, provided the enemy is willing to pay the price—in shells and casualties—in order to attain his objective.

III. ADVANTAGES AND DISADVANTAGES OF EVACUATION HOSPITALS NEAR THE FRONT

Large hospital centers undoubtedly offer many advantages, such as simplification of the supply question, specialization of treatment, and evacuation *en masse* of the wounded by sanitary train. It is also freely granted that a large hospital center is economical, complete in itself, and capable of rendering aid to a larger number of wounded men in a given space of time than would be possible with the same number of teams and beds scattered in small units over a given sector. Just so long as attacks were planned and carried out, by either group of belligerents, with "previously defined limited objectives in view," and the lines merely shifted from 1 to 5 miles one way or the other, these large centers were ideal and enabled the French to carry out primary suturing of a majority of war wounds with 85 per cent of successes. As soon as the Huns acquired the habit of bombing rear formations, the usefulness of

these large centers became questionable and, with a war of movement, their existence often came to a tragically swift end.

As it takes from three to five days to pack the equipment of a large hospital center, it is evident that an organization of this size is rendered valueless as soon as the fluctuations of the battle line become marked. Two examples which illustrate this point very forcibly came under the personal observation of the writer. When the British lines were suddenly forced back, late in March, 1918, several of their C. C. S.'s (evacuation hospitals) fell intact into the hands of the enemy, because our allies had no time to pack their equipment and in many cases could not even destroy the hospital buildings. During that same period, the large French hospital centers near the same sector were warned by their higher command to pack their equipment and prepare to retreat. Owing to the impossibility of foreseeing, from day to day, just where the retreat would cease and the line become stabilized, this same order was revoked and reissued no less than five times in ten days, the net result being that for fifteen days, and especially during the height of the battle, several thousand beds, with the necessary surgical teams and personnel, were rendered unavailable for the care of the wounded. Entire hospital formations spent these fifteen days packing or unpacking their equipment.

The second disadvantage of large sanitary formations installed near the front is that, being bulky, slow to build, and requiring supplies in bulk, they must be located near the railway and usually in close proximity to a station or rail head. As these same locations are necessarily those selected for artillery parks, munition depots, etc., we have the familiar combination which existed along the entire British and French fronts, of a large hospital center in close proximity to a railway station and surrounded by war materials of all sorts. The invariable explanation given was that the hospital site had been carefully selected in view of its non-military importance, but that, sooner or later, artillery parks and munition dumps would install themselves in neighboring fields and ignore the protests of the Medical Corps. Be that as it may—and the subject is well worth threshing out between the various branches of the Service—the fact remains that the Red Cross buildings were, all too frequently, in the line of fire or subject to aerial bombardment, which may or may not have been in deliberate violation of the Geneva conventions.

The outstanding lesson which we have learnt from the offensives

of the past three months is that a large, permanent or semi-permament evacuation hospital or hospital center (*Centre hospitalier*), situated from 8 to 15 miles from the firing line, will almost inevitably either be captured, forced to evacuate very hurriedly on account of shelling or aerial bombing, or rendered useless because of the impossibility of headquarters foreseeing, from hour to hour or even from day to day, just where the battle line would become stabilized.

As we have now entered the third and last phase of the conflict, the siege on a gigantic scale represented by trench warfare must cease, first in one sector, then in another. Any part of the line can be taken by either group of belligerents—for a price, and, from now on, the fluctuations of the battle are going to be such that a Sanitary Service which lacks mobility, elasticity and quick adaptability is bound to fail. The very serious losses through capture, of wounded, matériel, staff and personnel which our allies suffered during the recent Hun offensives, make it imperative that we readjust our conception of front-line surgical formations.

The inevitable corollary to the foregoing statement is that, in the zone of activities, large, permanent (or even semi-permanent) hospital centers are dangerous, costly or useless in a war of movement. With a rapidly fluctuating battle line, it is impossible to hospitalize patients within the zone of activities after they have been operated upon. Primary suturing, or finished surgery, as the French call it, cannot even be considered until the wounded man is at least from 30 to 40 miles from the firing line. This would seem to be the shortest margin of safety under present war conditions. On the other hand, it is manifestly impossible to transport a large percentage of non-operated wounds for that distance without increasing to altogther inexcusable proportions the number of fatalities through shock, hemorrhage, compression, peritonitis and gas-gangrene. We must therefore continue to maintain and operate surgical units close enough to the firing line to permit of the radical treatment of all severe and moderately severe wounds prior to their evacuation. It is manifest that field hospitals and field ambulances cannot undertake this task.

IV. SUGGESTED MODIFICATIONS

The only possible means of maintaining the service of the Medical Corps at its proper standard, regardless of the fluctuations of the battlefield, would seem to be through the equipment and

maintenance of relatively large numbers of small rapidly mobile surgical units, capable of operating upon relatively large numbers of cases and supplied with constant, rapid means of transportation.

Unless a central collecting point is available, to which the evacuable wounded from several mobile units could converge, evacuation by sanitary train is not practical, because the daily transfers from a given unit will rarely exceed thirty to thirty-five cases. Motor ambulances or canal boats, the latter fitted up with bunks and a surgical dressing room, should provide the means of transporting the wounded.

The manifest advantages of small mobile units are:

1. *Mobility.*—With a properly trained personnel, a moble unit of eighty to a hundred beds should be able to fold its tents, pack its equipment and be ready to advance or retreat within twelve hours after notice. If, in case of retreat, the margin of safety is too short, the equipment at least can be saved and the tents themselves readily set on fire and destroyed. If daily evacuations have been maintained, as they should be, so long as the trend of the battle is at all undecided, the mobile unit will not be faced with the problem of transferring more cases than its own ambulances can handle.

2. *Safety.*—A small unit can easily locate in a zone of relatively small military importance, *i. e.,* from one-half to one mile from the nearest railroad, bridge, cross-roads or main highway. It can camp in field, woods, quarry, etc., thus avoiding, as a general rule, depots of various war matériel, the discovery of which by the enemy is certain to provoke a bombardment.

3. *Simplified Organization.*—In order to greatly simplify the question of cadres and supplies, it is suggested that these mobile units, in groups of three to five, should form part of and depend entirely upon a conveniently located evacuation hospital for their staff, nurses, personnel, supplies and hospitalization, instead of being attached to a division and subject to removal from a sector with that division.

The proposed evacuation hospital group, composed of a hospitalization center containing from one to three thousand beds, located near a rail head, 30 or 40 miles from the firing line, and of three or more mobile units of eighty to one hundred beds each, should belong to the army and be assigned by the latter to a sector, thereby giving it more stability. This group would roughly correspond to the *Centre Hospitalier* of the French, except that the *auto-chirs* or mobile units, which the *Service de Santé* had gradually attached to

the H. O. E. (evacuation hospital) group of buildings, would now be operated 20 to 30 miles forward, spread out fan-shaped in a given sector the roads of which more or less naturally converged towards the evacuation group. Each evacuation hospital being entirely responsible for the equipment, maintenance and evacuation of its own mobile units, as well as for the hospitalization of the wounded from the latter, there would inevitably result a valuable saving in paper work—a very acute question in periods of great activity. The registrar of the evacuation hospital, being in constant communication with the mobile units belonging to it, would easily keep up the daily reports, etc.; the wounded would arrive, once or twice daily, with their field cards, on which the operating surgeon had entered: Anti-tetanic serum, morphine (if given), X-ray, diagnosis, operation, recommendations, etc. In other words, a mobile unit, operating as an annex to an evacuation hospital, would not have to take up any of its admissions. It should, and can, be spared these time-consuming details, and should be allowed to devote all of its energies to life and limb saving surgery. Each ambulance, as it brings in its load of wounded, can hand in a report of conditions to the evacuation hospital registrar, thus enabling the latter to notify the district surgeon of the exact number, condition and location of the wounded in a given sector.

The surgical supplies of a mobile unit would be maintained entirely through the evacuation hospital; rations should be obtained in the same way or, if more convenient, purchased through a local quartermaster who would settle the transaction with the evacuation hospital and not with the mobile unit.

Put tersely, a mobile unit is an advanced operating room with a few beds on which the wounded can rest immediately before and after their operation; its staff and personnel are there solely to minimize the losses incident to delayed operative interventions. On the contrary, the evacuation hospital, with its permanent administrative staff and hospitalization facilities, is the logical center in which to take up, classify and report on the casualties of its sector, besides continuing the treatment of the wounded arriving from the front. It would naturally seem to follow that the mobile unit should not be required to issue any independent reports or be burdened with administrative duties which can be attended to more thoroughly, completely and satisfactorily in the evacuation hospital of which it forms an integral part.

The only practical objection raised against small mobile units is

the difficulty of transportation. Almost all evacuations from mobile unit to evacuation hospital will have to be done by ambulance. If we are forced to discontinue the use of evacuation hospitals located close to the zone of activities—and the experiences of the past three months have amply shown that we shall be forced to do so—we must meet the extra demand and provide a larger number of ambulances per sector. Four motor ambulances, each capable of carrying four lying cases, should suffice for a mobile unit except during a period of intensive evacuations; each car could, if necessary, make two round trips in twenty-four hours (120 to 160 miles). Should the necessity arise, ambulances from less active mobile units and attached to the same evacuation hospital, could be sent up as reinforcement, just as the number of surgical teams can be temporarily increased from the same source. The operative output of three surgical teams, working on severely wounded cases only, would approximately equal the maximum evacuation capacity of the four motor ambulances. By having from three to five mobile units as an integral part of the organization of an evacuation hospital, with the latter belonging to the army and assigned to a sector, perfect harmony and close coöperation will exist between them as regards the proper distribution of ambulances and surgical teams, and we shall no longer see what has time and again occurred along the front, *i. e.,* a field hospital, advance surgical formation or evacuation hospital overwhelmed with work, while its neighbor, often only a few miles distant, though possibly almost empty, was not able immediately to lend a helping hand because it was attached to another division.

5. *Staff and Personnel of Suggested Mobile Units.*—While, at first thought, the number of officers, nurses and enlisted hospital corps men allotted to a mobile hospital might appear to be insufficient, the fact (brought out in the next sub-heading) that each unit will only have to complete its quota of eighty to one hundred operative cases before retiring to the evacuation hospital, must be taken into consideration. Under stress of battle, each unit would be replaced by a fresh one from the evacuation hospital within three to five days. That the work will be intensive is granted; that it will be no heavier than the amount evacuation hospital staffs and personnel are subjcted to during any severe battle is a matter of common knowledge. Practically, the work will be less harassing, because the mobile unit would be spared the time-consuming paper work which is a necessary incident to other hospital units.

Staff.—3 surgeons (majors or captains, M. C.); 6 first assistants (first lieutenants, M. C.); 1 radiologist (first lieutenant, M. C.); 18 nurses (8 ward nurses, 6 operating room nurses, 4 anesthetists); 24 hospital corps men, including one sergeant, three corporals (8 ward orderlies, 8 operating room orderlies, 4 cooks or helpers, 4 mess-hall, property, etc., orderlies). Total, 52.

The nurses and hospital corps men should, in general, work in twelve-hour shifts.

Working Shifts.—For the surgical teams, six and ten-hour shifts have both been tried out with excellent practical results. Either shift will approximately equalize the number of night hours in the operating room, the latter being notoriously the most likely to be busy during an active "show." With a three-team staff, a six-hour operating shift allows a twelve-hour interval for dressings, meals and sleep; the ten-hour shift has the advantage of a twenty-four-hour interval between operating periods. During the height of a battle, the ten-hour shift is preferable because the team is given ample time to recuperate its strength and attend to its ward dressings. Either schedule can be kept up for five days without jeopardizing the quality of the work. Longer shifts cannot be maintained without lessening the surgeon's power of judgment.

No regular shift is necessary for the radiologist. If he is reasonably expert with the fluoroscope, he can easily keep well ahead of the operating schedule and still find time for meals and sleep. The nurses and hospital corps men should, in general, work in twelve-hour shifts.

6. *Proposed Rotation of Service.*—If, as suggested, from three to five mobile units of eighty to one hundred beds each form an integral part of an evacuation hospital, there seems to be no logical reason why a rotation service cannot be instituted and maintained. The advantages of such a service are many and unquestioned. The type of surgery done would be kept at a uniform level of excellence because the teams and personnel would be replaced as soon as eighty to one hundred consecutive major operations had been performed. Under present conditions, it is notorious that the evacuation hospital staff and personnel are frequently obliged to work under conditions of mental and physical exhaustion bordering on collapse.

With a rotation service, the tired mobile unit would automatically return to the evacuation hospital, where it would continue the treatment of its own cases until such time as the latter were ready for evacuation to the base. While treating these cases, the

unit would be resting up for its next turn at the front. A fresh unit would take its place, ordered up from the evacuation hospital as soon as the regular quota of operated cases had been completed. There would be no delay, no loss of life-saving time, because the change would merely depend upon an interchange of messages between mobile units and the evacuation hospital forming part of a single command. The equipment of each mobile unit would remain in the same location as long as the demands of the battle required its presence there. Its location or displacement would be brought about through army orders issued to the commanding officer of the evacuation hospital.

From a statistical point of view, it is only through a rotation service, such as the one outlined, that definite conclusions can be arrived at regarding the efficacy of certain lines of treatment or methods of procedure. For almost four years the base surgeon has criticized the front line surgeon, and the latter has retaliated in kind, neither man knowing under what conditions the other was working, or the reasons which had prompted a certain line of treatment in one case and non-intervention in another. With the same surgical team operating on a given case and then treating it at the evacuation hospital until end-results were at least discernible, we shall, at last, get statistics which will have real scientific value for the present and future.

7. *Equipment.*—The double-walled Bessonneau tent has rendered excellent service wherever used; it is easily put up and taken down, is cool in the hottest weather and easy to warm during the winter months. Each mobile unit would require ten of these tents, utilized as follows: 4 tents for patients (24 to 30 cots to each tent); 1 tent for nurses, 1 for enlisted personnel, 1 for officers (½) and property (½); 1 for mess-hall, 1 for stores, and 1 for kitchen.

A demountable *Service de Santé* type barrack, combining operating room, surgical supply room and X-ray room, with its electrogenic and sterilizing auto-trucks, would complete the unit.

While far from ideal from a nursing point of view, the regulation folding army cot presents such incontrovertible transportation advantages that its use is advocated for patients as well as staff and personnel. Wounded men, fresh from the battlefield, will find these cots as comfortable as any bed, and they will be evacuated long before any of the discomforts incident to hospitalization can manifest themselves. The bedding equipment should be of the standard army type, everything being reduced to its simplest expression.

Folding type stools and tables will simplify the problems of transportation. A field kitchen, reinforced by four medium sized, oil (petrol) burning stoves, with a minimum of utensils, table ware, etc., will be found ample for a few days of intensive duty.

Just as the recent graduate in medicine has ten or more different drugs for the treatment of each disease, whereas the older practitioner uses the same drug for ten or more diseases, so does the embryo war surgeon demand refinements in instruments and accessories which he soon finds unnecessary, impossible to obtain or detrimental to operations *en masse* following a battle, because their use takes up too much time, space or personnel, thus retarding the limb and life saving interventions which must be rapidly performed in order to avoid gas gangrene, etc. This is no reflection on any individual surgeon; we have all had to pass through the same stage. The surgical equipment of a mobile unit should be of the simplest consistent with efficient treatment, which really means that no "fancy" instruments of any kind are needed, and that each surgeon, as he gradually acquires experience, will find that he can perform fully 80 per cent of all war interventions with a pair of scissors, a rat-tooth tissue forceps and a few hemostats.

8. *Transportation.*—Twenty 3-ton motor trucks can easily transport a mobile unit such as the one suggested. Each Bessonneau tent, complete, weighs 825 kilos; two and a half tents can be loaded on one truck. By having each truck make two round trips in twenty-four hours from the evacuation hospital to the site selected for the mobile unit, ten vehicles can bring everything up in one day. The first convoy would carry the tents, operating barracks and kitchen outfit, the second one bringing up the cots, bedding and accessories. The enlisted personnel would travel on the trucks, the officers and nurses in the ambulances. As the detached duty is one of very short duration and the entire unit would return to its former post, the personal effects required by each individual would be reduced to a minimum.

9. *Type of surgery* which should be done in a mobile unit.

(*a*) *During the progress of a battle.*

1. Imperative cases such as severe hemorrhages, edema of the glottis, intraabdominal lesions, intracranial lesions with clinical symptoms of compression, intrathoracic wounds with shell-fragment *in situ* and clinical evidence of unchecked hemorrhage.

2. Treatment of shock cases prior to operation, by means of the hot-air chamber (*cellule chauffant*), by infusion, transfusion, etc.

3. Immobilization of all fractures after excision of lacerated muscle tissue and removal of all detached bone fragments (*esquillectomie*).

4. Penetrating or perforating shell wounds involving the muscles of the arm, forearm, buttocks, thigh and calf of leg. In all of these cases, the operation should stop at the *débridement* of lacerated muscle tissues, removal of the shell fragment and other foreign bodies and careful hemostasis.

All moderately or slightly wounded cases which can safely be transported 30 to 40 miles without surgical intervention should go directly to the Evacuation Hospital after receiving a simple occlusive dressing and immobilization when necessary.

Evacuations should occur once or twice in every twenty-four hours. Compound fractures, after thorough *débridement* and *esquillectomie*, should be immediately evacuated to the Evacuation Hospital, properly immobilized.

Depending upon the severity of automobile transportation (bad roads, etc.), intracranial, intrathoracic and intraabdominal wounds will require hospitalization in the mobile unit varying from three to ten days. All other severe cases can be evacuated within twenty-four hours, unless in shock.

With available canal-boat transportation, the severest type of wounded can be evacuated immediately after operation, if necessary. An ordinary canal boat (*péniche*), either propelled by its own steam or drawn by a tug-boat, can be rapidly fitted up with seventy bunks for "lying" cases and can accommodate an additional hundred "sitting" cases. Wherever possible, the excellent canal systems of northern France and Belgium should be utilized.

(*b*) *During periods of calm.*—During periods of ordinary sector "strafing," and in order to continue utilizing the bed capacity, staff and personnel of the mobile units, the latter—of course subject to military orders—could be allowed to do primary suturing on suitable cases. All wounds requiring prolonged hospitalization, and especially all fractures of the long bones, should continue to be rapidly evacuated to the Evacuation Hospital. If this period of calm exists throughout the entire sector of an Evacuation Hospital, the latter could be kept busy through hospitalization of fractures of the long bones and other types of slow healing wounds. Both Evacuation Hospital and mobile units would proceed to an immediate transfer of their respective cases as soon as notified of an impending attack (offensive or defensive). The

mobile units would empty all of their beds in anticipation of a new convoy, while the Evacuation Hospital transferred its hospitalized cases to the base.

CONCLUSIONS

(*a*) Evacuation hospitals cannot be placed near the firing line during a war of movement; they are even exposed to long range artillery fire and aerial bombing when the lines are stabilized, because it is almost impossible to pick out in the zone of the advance, a suitable site which is not of military importance for the enemy to destroy, if he can.

(*b*) Major surgery must be done near the battle line if losses through hemorrhage, gas gangrene, etc., are to be minimized.

(*c*) Small mobile units, in sufficient numbers, can solve the problem of urgent war surgery.

(*d*) The unification of command, with absolute interdependence of a varying number of mobile units with their evacuation hospitals, would seem to offer many and serious advantages.

Editorial Comment.—The above article by Major de Tarnowsky was referred by the Chief Surgeon, A. E. F., to the Chief Surgeon, First Army (Colonel A. N. Stark, M. C.) for comment. He remarked that the article was an excellent one in its statement of the disadvantages of the large immobile evacuation hospitals which under the system of trench warfare had grown up close behind the lines, but that the writer was probably not familiar with the medical organization which had been recently developed in the American First Army to avoid these disadvantages and meet the far more difficult requirements of open warfare. He suggested therefore that the article should be published but supplemented by an editorial note which would inform the readers of the Journal that the defects of the system described by Major de Tarnowsky had been recognized and overcome by an ingenious use of the existing medical units of the American Army. As the Editor does not feel qualified to discuss so technical and tactical a question, the following note has been contributed by Brigadier General J. R. Kean, M. C., who has recently returned to the U. S. after fourteen months service in France.

Note.—The U. S. Army units for the evacuation of the wounded consist of three ambulance companies, four field hospitals, and two evacuation hospitals to each division. The field hospitals are mobile—that is, they are tent hospitals with light equipment and their own transportation. As stated by Colonel Stark, they are now employed as follows: Two of the field hospitals are placed together as near the battle line as is prudent, it being borne in mind that in these days of long-range artillery and bombing by aviators, hospitals of this kind cannot be made entirely safe. To these hospitals are added surgical teams, shock teams, and a mobile operating unit (*groupe complémentaire*) equipped with X-ray apparatus, steam sterilizer and the

other necessities for surgical work. To this divisional hospital group the wounded are brought by the ambulance companies to be sorted out and their further disposition is decided according to the nature and gravity of each case. The non-transportable cases are kept there, operated on at once and given a bed. A large proportion of wounded will stand transportation for several days under a good primary dressing and all such cases are sent on at once, either to the evacuation hospitals or to the base hospitals further to the rear. It will be seen that this hospital group corresponds in function to the French *triage* hospitals. Tetanus antitoxin is given to all wounded; shock cases are treated by heat; hemorrhages are stopped; fractures, if not already suitably dressed, are put up by standard methods for transportation; and the graver injuries are given such surgical assistance and dressings which will enable them to stand the trip to the evacuation hospital. As only two hundred patients can be given beds, the chief function of these hospitals is the preparation of the wounded for the journey to the evacuation hospitals which, under the conditions of open warfare, must necessarily be much further from the battle line than was customary with our allies in the days of trench warfare. This *triage* group takes two of the field hospitals of the division. A third is equipped for the treatment of gassed cases and is usually some distance and on a different road from the former. The fourth field hospital is in yet another location and is set aside to receive the sick including infectious cases. The evacuation hospitals are of a thousand bed capacity, although many grow to a greater size by crisis expansion. Their operating staffs are reinforced by joining to them mobile hospitals and numerous surgical teams. If a mobile hospital is pitched by itself, it is by reason of its small bed capacity immediately filled up and then its surgical staff are not fully occupied until it can be evacuated. Colonel Stark mentions a case where for experiment a mobile hospital was pitched by itself. It was filled to capacity in twenty minutes and required two weeks to be evacuated and become again mobile. Small mobile units are therefore very uneconomical, and matters of supply and other administrative details would be made much more difficult. If properly supplied with transportation, ambulances and motor trucks, the evacuation hospitals can be made fairly mobile, but this was not possible with these units in the A. E. F. except in special cases where transportation was borrowed from the French because of the deficiency of transportation for the Medical Department in our Army. This was of course caused by the difficulty of supplying an army three thousand miles away under the handicap of submarine attacks, and the military demand for men and food before all else.—J. R. K.

EPIDEMIC MENINGITIS SITUATION AT CAMP MacARTHUR[1]

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INTRODUCTION

THE winter of 1917-18 has been the first which has seen large numbers of men from various parts of the country congregated in the military camps. The epidemic diseases encountered in such camps, the methods used in overcoming them, especially when such methods were successful, are worth recording. This, I feel, is the case with epidemic meningitis at Camp MacArthur. This article is a description of the meningitis situation at this camp, methods of procedure in dealing with detection of carriers, and the outcome. The word "situation" is used rather than "epidemic" because at no time has the disease assumed an epidemic form; at no time did we have a second case in any company or squadron, after these were once cultured and the carriers isolated; nor did we have any case develop amongst those detected as carriers. How much of this is due to the methods used and how much to coincidence, no one could venture to say, but the fact was certainly a happy one.

I. DETECTION OF CARRIERS

The most important prophylactic measure in this disease is the detection, isolation and treatment of the meningitis carriers. Upon this single measure, if successfully carried out, will depend the possibility of nipping in the bud the ravages wrought by this disease, if allowed to become epidemic in form. All the conditions necessary for the rapid spread of this disease are not wanting in military camps, especially during the winter months. For this reason prompt action must follow to detect the possible carriers, in order to break a link in the chain of the vicious circle established by the occurrence of a case of meningitis in a military camp. The probability that the disease develops from meningococci, appearing first in the nasopharyngeal mucous membrane, would, if detected before the disease established itself, save the development of many cases of actual

[1] Read before the medical officers of Camp MacArthur, Waco, Tex., at a stated meeting, June 17, 1918.

meningitis. This is another good reason for the prompt detection of carriers.

Method.—Upon the occurrence of a case of meningitis—that is, as soon as the diagnosis was made—the whole company or squadron, consisting of about 200 individuals, was at once placed under quarantine, cultured, and the possible carriers isolated and treated.

The culture medium in use at the beginning was serum water glucose agar; later, 5 per cent human blood in glucose agar. The petri plates were divided with a glass pencil into two, or at most three parts. The "West tube" was found cumbersome. The straight wooden nasal swab was found most expedient and gave good results; it does away with the necessity of tongue depressors and the possibility of saliva admixture while withdrawing the swab.

A roster of the company or squadron was prepared in duplicate. The whole company was lined up according to roster and two swabbers set to work, one taking the company from 1 to 100, the other from 101 to the last, each having a clerk read off the name and number, the latter to correspond to the number on the plate. When swabbed, the men were seated facing the light; the swab was passed through the anterior nares along the floor of the nose until the posterior wall was reached. The swab was then rotated, touching posterior pharyngeal wall and Eustachian eminences, withdrawn carefully, inserted in the second nostril and the same procedure carried out. The mucus was then planted on the part of the plate to correspond with the number of the man; three streaks were made with the tip of the swab radiating from the place where the mucus was first deposited. As a rule there was not much mucus to interfere with the obtaining of individual well disseminated colonies. The plates were placed in closed buckets, kept warm by means of hot-water bottles while in transit to and from the laboratory. Upon reaching the laboratory they were immediately placed in the incubator.

Identification of the Organism.—The method described by Flexner[2] was closely followed. The plates were incubated overnight at 37°; at 10 a. m. the next day they were removed and kept at room temperature, and examined at 1 p. m. Suspicious looking colonies were smeared on slides and stained by Gram's method; and if found Gram-negative were subcultured on slanted blood agar or serum water glucose agar slants for further study and agglutination. Those persons whose culture showed Gram-negative diplococci

[2] *Jour. Am. Med. Assn.*, September 1, 1917.

and colonies typical of meningococcus were considered probable carriers and at once isolated from the rest of the company, and spraying with dichloramine-T was instituted.

Early in this work it was noted that, if the plates that showed Gram-negative diplococci were left at room temperature overnight and re-examined the next day, a number of them developed pigment, or became opaque and large, showing definite characteristics of *Micrococcus catarrhalis, flavus,* or other indefinite Gram-negative organisms which grow at room temperature. Keeping the plates for another twenty-four hours at room temperature has saved considerable time in attempts at agglutination.

If the culture showed colonies that were fairly transparent, with edges that blend with the culture medium, somewhat larger than pneumococcus colonies, consisting of Gram-negative diplococci, and not changing when kept at room temperature overnight, the person from whom the culture came was considered a probable carrier and treated as such. Subcultures were made and agglutination proceeded with; if negative, the supposed carrier was at once released. But if the subculture failed and agglutination was not possible, he was kept until found free of Gram-negative diplococci upon subsequent cultures.

Colony and staining characteristics as well as morphology were found to be the most reliant; while isolation for agglutination was attempted in every case, it must be admitted that it was successful only in a small proportion. The chief difficulty was in obtaining a growth on the subcultures for the agglutination. In some cases fermentation reaction was resorted to as a last measure. The results certainly proved the advisability of our procedure. The fermentation reaction is worth resorting to and is very simple; the meningococcus, as is well known, ferments maltose and glucose, but not saccharose; the catarrhalis does not ferment glucose, while other Gram-negative organisms ferment saccharose. (Dextrose, maltose and saccharose bouillon put up in Durham's fermentation tubes, to which is added azolitmin solution as an indicator, with the addition of serum water in proportion of 1 to 5, is to be recommended for the purpose.)

Culture Media.—As already stated, the culture medium used in the beginning was 2 per cent agar from beef infusion broth, 1 per cent dextrose, to which has been added serum water in proportion of 1 to 5 (human serum obtained in a sterile way and mixed 1 part to sterile water 3 parts), reaction 0.4 to phenolphthalein; this gave a perfectly clear transparent medium and grew the meningococcus

readily. Later, however, this was replaced by 5 per cent human blood added to the glucose agar, which has been used to date.

The glucose agar is kept in 1,000 c.c. flasks in amounts of 500 c.c. in each flask; eight such flasks are kept on hand in the refrigerator. When necessity arises, the contents of four of these flasks are melted, and cooled to 45° C. 25 c.c. of blood is obtained from the arm vein in a sterile way, immediately added to 500 c.c. of melted agar and at once plated out. If the work is done in a room with closed windows and the plates protected from dust, the danger of contamination is reduced to a minimum.[3] From 35 to 40 plates are obtained from each of the 500 c.c. of agar, making 140 or more plates from the four flasks, each divided by two, giving more than enough for the culturing of a whole company. All this can be done within two hours, and the culturing of a whole company as outlined above takes from one and one-half to two hours. The other four flasks are used to re-culture the whole company on the second day, while more media is made up and a third culture is taken again on the third day.

The advantage of this procedure is obvious. Within four hours of the appearance of a case of meningitis we had the whole of the company under quarantine and cultured. The second and third cultures, I believe, are necessary. Our findings have demonstrated the advisability of this procedure; the chances of error are minimized and skipping or overlooking an active carrier through various causes is made impossible. The use of fresh blood instead of defibrinated or laked blood or serum water agar is to be recommended, especially when working with enlisted personnel who are not trained technicians; the less one has to handle a culture medium that can not be autoclaved before use, the better.

The straight blood agar plate has also served another purpose—the detection of hemolytic streptococcus. This, I feel, is as important as the detection of meningococcus carriers because of the streptococcus broncho-pneumonia, against which we have practically no remedy other than preventive.

Number Cultured and Percentage of Carriers Found

This report is based upon a study of 6,926 cultures on a total of 2,568 individuals. Of this number, there were 56 positive carriers and 2,512 negatives. The low percentage (2.25) of positive carriers may be accounted for partly by the fact that most of these indi-

[3] A long piece of beaver board or an ordinary board 18 cm. wide is set up on two test tube racks on the laboratory bench, the whole covered on all sides with a cotton sheet. The petri plates are set up under the board and are thus completely enclosed from all sides. The sheet is raised slightly in front while the medium is being plated. Endo plates have been prepared in this way in large numbers and with very little contamination.

viduals were really not "close contacts." The association between men in a camp living in tents, most of the time in the open, where the weather is fairly good, is not very intimate. Occupants of the wards where one patient was from a few hours to a few days, but confined to his bed, should also be considered not "close contacts." The most important factor, however, in the low percentage of carriers was the prevailing good weather. From tables in my possession of weather conditions in January and February (U. S. Department of Agriculture, Weather Bureau, Office of Coöperative Observer) I find that there were three rainy days in January (11th, 3 inches of snow; 14th and 22nd, one-half inch of snow), and one rainy day in February (17th). The temperature was also not very low; on only three days in January the mean temperature went below 30 degrees, and on only one day in February.

Table 1 gives a detailed account of the organizations cultured, number and percentage of carriers found, and the total number of individuals cultured. Reference to this table will give at a glance a clear idea of this part of the work.

Some of the groups are here considered individually in order to bring out some points that cannot be shown in the table.

Group 1: The reason for culturing the first organization, on December 17, 1917, for meningococcus carriers, was because it was reported by wire that a member of this organization on furlough died of epidemic meningitis at Cook County Hospital, Chicago. He left camp on Wednesday feeling well and died on Saturday soon after his arrival in Chicago. His company was at once placed under quarantine and cultured. Out of 221 men, only one positive carrier was isolated. This company was cultured three times (December 17, 20 and 24, 1917), but no other case developed among these men. It was felt at the time that the patient who died had contracted the infection on the train or just before leaving, rather than in camp. Certainly, the finding of only one carrier and the absence of another case were very suggestive. Thus in this company of 221 men, probably not "close contacts," only one carrier, or 0.45 per cent, was found.

Group 2: The second group, consisting of 199 men, in which a case of meningitis occurred (the first case in camp), was cultured for the first time on January 17, 1918. This company yielded five carriers; one on the first culture, three on the second, and one on the third. One streptococcus hemolyticus carrier was also detected.

Thus this group of "moderately close contacts" yielded 2.5 per cent of positives. The necessity of culturing three times instead of

once is fairly well illustrated in this company, where three positives were detected on the second culture and one on the third. Other similar findings have occurred and will be referred to later.

Group 9. This group was that of a squadron 198 strong. All were cultured three times (January 29, February 5 and 9, 1918), and all were found negative. The case of meningitis from this group, fairly fulminating, was admitted on January 28 and the patient died on February 3, 1918. That the finding of positive carriers is in inverse relation to the severity of the case is suggested by this group and by group 3.

Group 10. This group consisted of a squadron 191 strong. The first culture (February 3, 1918), yielded 7 positive; the second (February 5), one positive; and the third, two positive carriers; a percentage of 5.3, the highest percentage of positive carriers in any group.

This relatively high percentage may be explained by the fact that one case from this squadron was admitted to the hospital on January 21, 1918, with indefinite symptoms until on February 2, when a lumbar puncture was done and the diagnosis of meningitis established. Meanwhile, on January 29, 1918, another case of meningitis developed in the same squadron (before the first case was diagnosed), at which time the squadron was at once quarantined and carriers isolated. No additional case appeared after that. This incident strongly suggests the value of early diagnosis by lumbar puncture.

Group 11. This group is a squadron of 191 cultured for the first time February 7, 1918, when two positives were found; the second time (February 10), four positives were detected; and the third time (February 13) there were two positives. The meningitis case of this group was brought to the base hospital in a comatose condition; 30 c.c. of spinal fluid was withdrawn and serum administered, followed by uneventful recovery. This group and the preceding one, as well as group 18 to follow, show the necessity of three successive cultures. The percentage of positive carriers in this group is 4.2.

Group 18. In this squadron, 153 strong, a case of meningitis occurred and was cultured for the first time May 18, 1918. At that time only the tent-mates, five in number, were cultured with negative findings. These five men were cultured for the second time, two days later and were again found negative. On the same day the rest of the squadron, 148 in number, were cultured and one carrier detected. The meningitis patient remained with his company for four days before he was sent to the hospital. The low percentage of

positive carriers (0.65) under these circumstances can only be explained, I believe, by the warm weather, open tents, and outdoor life.

This squadron was cultured according to directions in a pamphlet[4] received from the Surgeon General's Office, which read:

XII. *Indications for Culturing.*—On the appearance of a case of cerebrospinal fever, all contacts should be cultured for the detection of carriers as soon as possible. By contacts is meant those intimately associated with the patient—that is, all those in the same tent or squad room with him, as well as his close associates at mess or elsewhere.

Experience has shown the inadvisability of attempting to culture larger groups than this.

In military service, those who give positive cultures should be held in the detention camp until they have had three successive negative cultures at five-day intervals. If a second case appears in the same company within a week of the first case, the whole organization should be swabbed.

This particular squadron was under orders to leave, and had a second case developed it would have necessitated their stay for another week, while it was just as easy to culture the whole squadron as the tent-mates only. The isolation of the positive carrier found in this squadron at large minimized that chance.

I feel that our experience here in camp fairly warrants the statement that the whole company or squadron messing together should be considered "contacts" and all cultured twice, or three times if possible. All this can be done within one week and the squadron released while the carriers are isolated for treatment and observation.

Duration of the Carrier Stage

It is interesting to note the length of time that meningococci persisted in the nasopharynx of carriers. Of a total of 56 isolated, 24 were treated in the hospital, where records have been kept. Treatment with Dakin's solution and dichloramine-T has been recorded in ten cases. In one of the remaining cases there is a record of treatment with Dakin's solution alone. Although the treatment was not recorded in the other thirteen cases from personal information from the head nurse of the ward, it appears that most of the others had treatment in some form—either Dakin's solution alone or combined with dichloramine-T.

Of the 24 carriers, 3 were discharged in 5 days; 9 in 6 days; 3 in 7 days; 1 in 9 days; 2 in 10 days; 5 in 11 days; 1 in 12 days; thus

[4] Standard technique of meningococcus carrier detection. Adopted by the Medical Departments of the United States Army and Navy and the United States Public Health Service.

an average stay in the hospital of 7 days with a minimum of 5 days and a maximum of 12. Here too, I believe, the warm weather as well as the treatment had something to do with the rapid clearing up of the carriers. *We had no chronic carriers.*

Two nurses and one physician taking care of the meningitis cases were cultured and found positive to meningococci. All three, however, were found negative at the end of 5 to 7 days. None of the carriers developed meningitis, nor, as already stated, has there developed in any organization a second case once the organization was cultured and the carriers isolated.

II. MENINGITIS CASES

There were to date in this camp 13 cases of epidemic meningitis. Eleven of these recovered and two died—making a total of 82 per cent of recoveries. These cases were followed clinically by the ward surgeons under the direction of the Chief of the Medical Service. The diagnosis was made by laboratory findings, the meningococcus being demonstrated in the spinal fluid in each case except the last one (case 13 in Table 2). In this case a most careful bacteriological examination of turbid spinal fluid of three successive days proved negative; blood cultures were sterile and cultures from posterior nares were also negative for meningococcus. Response of the patient to the antimeningococcus serum—his symptoms and spinal fluid cleared up within four days—was accepted as evidence of epidemic meningitis.

Agglutination was carried out with the therapeutic sera on hand at the beginning, in order to establish which of the sera was best. We had N. Y. Board of Health serum and that of a commercial house. The meningococcus obtained from the spinal fluid of the first case of meningitis was used in the test. It was found that while the N. Y. B. H. serum completely agglutinated in dilutions of 1 to 2,000, with the commercial serum only partial agglutination occurred in dilutions of 1 to 50 and none in dilutions of 1 to 100. Naturally the N. Y. B. H. serum was recommended and used in all cases. I well recollect the ward surgeon (Lieutenant Preston) complaining of the lack of clinical response when he used the commercial serum after we ran out of the N. Y. B. H. for a short time. We felt that the clinical findings corroborated the agglutination reaction. I feel that our low mortality rate (18 per cent) is in a great measure due to the use of a therapeutic serum demonstrated by laboratory methods to be effective against the particular type of meningococcus with which we had to deal.

The data here given of the thirteen cases were obtained entirely from a critical analysis of the clinical records. All these data will be found in detail in Table 2. It is of interest to note that eleven of the thirteen cases occurred within twenty-five days (January 16 to February 10), which were the coldest days of the winter. Four of these came to the hospital in one day, each from a different squadron. The twelfth case appeared on March 30, about seven weeks after the last preceding case; and case 13 appeared about seven weeks after that. The first eleven cases would suggest that the disease had started to assume epidemic form and that the measures taken for the isolation of carriers had probably considerable to do in checking it. The last two cases are apparently sporadic.

Symptoms on Admission.—The symptoms on admission are worth calling attention to. Nine had headache and stiffness or pain in neck muscles; four were comatose with stiffness of neck or positive Kernig's.

I wish to emphasize here that, while it is fairly easy to make a diagnosis when the patient shows definite symptoms severe enough to leave no doubt in one's mind, it is of extreme importance, if the spread of the disease is to be avoided, to make a diagnosis early in those cases that present indefinite or mild symptoms. I believe that if attention be paid to the following symptoms—headache, pain or stiffness of the neck muscles with a positive Kernig's; when in doubt a culture for meningococcus from the posterior nares, and finally a lumbar puncture—the diagnosis could be settled without difficulty. The lumbar puncture, if properly performed, does not peopardize the patient's chances in the least and is the best means of definitely establishing the diagnosis.

Prognosis.—Four cases were admitted to the hospital in a comatose condition and recovered, while the two that died came in with symptoms not so grave. The onset of the disease—as far as could be judged from this small series of cases—is no criterion as to the outcome of the case, at least under serum treatment. This fact has been referred to by Flexner[2] and others.

The average length of time that those who recovered showed symptoms of meningitis after the serum treatment was begun is 8.6 days, the maximum 14 and the minimum 4 days. The average length of time in the hospital for meningitis in cases followed by recovery was 45 days, with a maximum of 110 days and a minimum of 23. The patient who remained in the hospital for 110 days had a relapse 31 days after his first attack and during convalescence. The average number of doses of antimeningococcus serum administered

was 8, with a maximum of 17 and a minimum of 2. Three of the cases received the first dose of serum on the first day of the disease; four on the second; two on the third; one on the fourth; one on the fifth; one on the sixth; and one on the thirteenth day.

There does not seem to be, in this series, any relation between the day of institution of the serum treatment and the mortality rate. In fact, in each of the two fatal cases the serum treatment was begun on the second day.

Complications and Sequelae

An analysis of the records shows the following complications to have occurred:

Ear.—One patient showed marked deafness on the day after admission, grew steadily worse and died in 18 days. In the second case there was transient pain which yielded to treatment. Ear complications in 18 per cent.

Eye.—One patient had double vision and paralysis of the right rectus muscle, and another a mild conjunctivitis; both recovered. A third case was followed by blindness of the right eye, diagnosed by the eye specialist as amaurosis, either of nerve or brain origin from behind the retina. Eye complications in 23 per cent.

Arthritis.—In none of the cases was there true arthritis.

Mental.—One patient developed a psychosis, diagnosed as dementia precox, and is still in the hospital. He is the only one who developed a psychosis, making 9 per cent.

Orchitis.—There were two cases of orchitis with recovery in both (18 per cent).

Serum Disease.—In four cases serum disease developed. In two on the tenth day following the administration of the first dose of serum; in one on the fifteenth day; and in one on the seventh day after the first serum treatment for his relapse; in this last case there was no serum sickness during the first attack.

Five of the thirteen cases showed no complications.

In the eleven cases that recovered, five had no complications and no sequelae. In four of the remaining six cases the complications were of a transient nature with subsequent complete recovery; while, of the other two, one is still in the hospital with a psychosis and the other was discharged with blindness of one eye. The other eye shows vision 20-70.

Relapse.—In only one case was there a relapse of the meningitis —while convalescing in the hospital thirty-one days after the first attack—but finally good recovery resulted.

Mortality.—The mortality in this series of thirteen cases was two, or 18 per cent.

The mortality, as given by Flexner, in epidemics of this disease in various parts of the world ranged between 42 and 90 per cent in those cases that were not treated with serum; and from 25 to 30 per cent in those cases that were treated with serum. Our mortality of 18 per cent is certainly not excessive.

SUMMARY

It may be well to bring together here briefly all the facts that were brought out in this paper.

The total number of cultures studied was 6,926 on a total of 2,568 individuals, made up of 18 groups (9 squadrons, 3 companies, 5 wards and one group composed of guards and prison mates). The number of positive carriers was 56, making 2.25 per cent of the total cultured. The highest percentage in any group was 5.3. None of the groups could be called "close contacts," because of the open-air life in the case of the squadrons, while in the wards the patients were kept in bed. The average length of time in 24 of the 56 carriers, where records were kept, that the meningococcus persisted was 7 days—a maximum of 12 and a minimum of 5 days. Practically all the 24 carriers had some treatment while they remained in the hospital. *We had no chronic carriers.* Whether the treatment had anything to do with the way the carriers cleared up is hard to tell; the treatment is simple and worth undertaking. The fact that at no time did we have a second case develop in any of the groups that were once cultured and the carriers isolated, demonstrates the value of the method of procedure we have carried out in this camp.

There were thirteen cases of epidemic meningitis in this camp; eleven occurred within 25 days (January 16 to February 10), which were the coldest days of the winter. The last two cases could be considered sporadic in nature. Four of the eleven occurred on one day (January 28). Cold weather apparently causes a more intimate association of the men and direct transmission from carrier to susceptible individuals is here suggested.

Lumbar puncture has been the final and definite means of diagnosis in this series and it cannot be emphasized too strongly that, in cases with symptoms at all pointing to meningitis, more especially when other cases of meningitis have occurred, lumbar puncture should be resorted to and done early. It should be done not merely from the standpoint of diagnosis and the patient, but for the sake of the many as a public health measure.

The average length of time that the patient actually showed symptoms of meningitis after serum treatment was instituted was 8 days, a maximum of 14 and a minimum of 4 days. The average number of doses of serum given was 8, a maximum of 17 and a minimum of 2. The sequelae of the cases that recovered were: One is left with loss of sight in one eye, and another with a psychosis; five had no complications at all, and the complications in the others were fairly transient in nature. (The four with the serum disease and the two with orchitis recovered.)

CONCLUSION

The only conclusions that may be drawn from the foregoing are:

1. The members of a whole company or squadron who mess together should be considered "contacts" and cultured for carriers upon the appearance of a case of meningitis.

2. The culturing of a whole company for three successive times at intervals of two to three days will minimize the possibility of overlooking any positive carriers.

3. Five per cent blood glucose agar plates is the medium easiest of access and has given the best results. It also makes it possible to identify hemolytic streptococcus carriers.

5. The serum treatment apparently reduced the mortality of this disease in this camp to a minimum (18 per cent). The therapeutic value of the serum to be used may be determined by agglutination tests, using the particular organisms isolated from the first cases to appear.

In concluding I wish to thank Lieut. Col. S. W. French, the commanding officer of the base hospital, for his hearty coöperation in carrying on this work; and to express my appreciation to Lieutenants J. H. Murphy and O. C. Hirsch, who have done a considerable part of the laboratory work connected with this study.

TABLE 1.—*"Contacts" Cultured*

No. of group	Organization	Date	No. of culture	Negative	Positive	Total cultures	No. of individuals	Per cent of carriers	Remarks
1	Co. A, 126th Inf.....	12–17–17	1	186	...	186	186	0.45	Not "close contacts." Meningitis case died while on furlough upon arrival in Chicago.
		12–18–17	1	35	1	36	36	....	
		12–20–17	2	207	...	207	...	....	
		12–24–17	3	217	...	217	...	....	
2	Sqd. 30, A.S.S.C.....	1 –17–18	1	198	1	199	199	2.5	First meningitis case in camp. "Moderately close contacts." (1 streptococcus hemolyticus carrier.)
		1 –19–18	2	188	3	191	...	....	
		1 –22–18	3	190	1	191	...	....	
3	Sqd. 15, A.S.S.C.....	1 –21–18	1	190	...	190	211	....	Difficult to explain absence of carriers. See text.
		1 –25–18	2	211	...	211	...	....	
4	Ward 23, B. H.....	1 –22–18	1	53	...	53	56	....	Meningitis case developed in ward following measles. No carriers.
		1– 23–18	2	56	...	56	...	....	
5	Sqd. 43, A.S.S.C.....	1– 22–18	1	184	5	189	191	3.13	Not "close contacts." Meningitis case developed after 10 days in hospital, following measles.
		1 –24–18	2	191	...	191	...	....	
		1 –28–18	3	185	1	186	...	....	
6	Ward 20, B. H.....	1 –28–18	1	43	...	43	43	....	A ward of not "close contacts." No carriers.
		1 –30–18	2	43	...	43	...	....	
7	Co. L., 128th Inf.....	2 – 2–18	1	191	1	192	196	1.5	Not "close contacts." Case fairly fulminating.
		2 – 3–18	2	189	2	191	...	....	
		2 – 5–18	3	196	...	196	...	....	
8	Sqds. 5 and 375, A.S.S.C..	1 –31–18	1	187	3	190	197	1.5	Comatose when admitted. Probably not "close contacts." (1 positive streptococcus hemolyticus.)
		2 – 4–18	2	197	...	197	...	....	
		2 – 6–18	3	195	...	195	...	....	
9	Sqd. 61, Ret. A.S.S.C.....	1 –29–18	1	198	...	198	198	....	Fulminating meningitis. No carriers.
		2 – 5–18	2	198	...	198	...	....	
		2 – 9–18	3	197	...	197	...	....	

10	Sqd. 28, Rct. A.S.S.C.....	2 – 3–18	1	182	7	189	191	5.3	First meningitis case not diagnosed until 3 days after second case occurred. (2 positive streptococcus hemolyticus.)
		2 – 5–18	2	184	1	185	...	....	
		2 –11–18	3	189	2	191	...	....	
11	Sqd. 56, Rct. A.S.S.C.....	2 – 7–18	1	189	2	191	191	4.2	Case comatose when admitted. Necessity for 3 cultures shown. See text.
		2 –10–18	2	186	4	190	...	....	
		2 –13–18	3	185	2	187	...	....	
12	Grd. and Pr. 324, Rmt...	2 –12–18	1	32	...	23	23	4.0	Supposed to be "close contacts"; guard and prison inmates.
		2 –14–18	2	23	...	23	...	....	
		2 –16–18	3	21	...	21	...	....	
13	Sqds. 19 and 375, A.S.S.C.	2 – 9–18	1	189	4	193	193	5.0	Meningitis mild. Per cent of carriers relatively high. See text.
		2 –12–18	2	188	3	191	...	....	
		2 –14–18	3	185	3	188	...	....	
14	Ward 20, B. H.....	2 – 3–18	1	28	...	28	29	3.4	Patient in bed 10 days. Per cent of positives low. (1 strep. hem.) See group 15.
		2 – 5–18	2	29	...	29	...	....	
		2 – 6–18	3	28	1	29	...	....	
15	Ward 6, B. H.....	2 – 4–18	1	44	...	44	44	....	Case in bed 5 days. No spread of infection when in bed.
		2 – 6–18	2	41	...	41	...	....	
		2 – 8–18	3	34	...	34	...	....	
16	Ward 18, B. H.....	2 – 6–18	1	35	...	35	35	2.8	Case in ward few hours. (1 strep. hemolyt.)
		2 – 7–18	2	34	1	35	...	....	
17	Hdq. Co. 21, F.A.....	4 – 1–18	1	191	5	196	196	3.0	Case mild. Four days in company before sent to hospital. See remarks on group 18.
		4 – 3–18	2	191	1	192	...	....	
		4 – 5–18	3	191	...	191	...	....	
18	Sqd. 616, A.S.S.C.....	5 –18–18	1	5	...	5	153	0.65	Mild case; warm weather may explain low per cent. See text.
		5 –20–18	2	5	...	5	...	....	
		5 –20–18	1	147	...	148	...	....	
	Total.....	.....	. .	6870	56	6926	2568	2.25	

TABLE 2.—*Meningitis Cases*

Case No.	Date of admission	Meningococcus in spinal fluid	Symptoms		Total doses serum	Day in disease serum first given	Days in hospital for meningitis	Complications and sequelae	Result	Remarks
			On admission	Cont'd for days						
1	1-16-18	Positive.....	Comatose, stiff neck, Kernig's positive.	8	10	1st	48	Double vision; bilateral orchitis; serum disease 10 days after first injection.	Recovery.....	First case in camp. Whole squadron cultured, 5 carriers isolated, no other case in squadron.
2	1-20-18	Positive....	Headache, stiff neck, Kernig's positive.	5	6	1st	34	None.....	Recovery.....	Admitted with measles; 5 days after eruption cleared, meningitis. No other case in ward.
3	1-18-18	Positive.....	Severe headache, pain in neck.	18	11	2d	18	Marked deafness.....	Death (grew worse steadily).	Lack of response to serum and deafness suggest pneumoc. infection. Five doses of anti-pneumococcus serum given. Autopsy disproved latter.
4	1-21-18	Positive.....	Pain in head, vomiting. (Fainted at mess.)	10	8	13th	45	.....	Recovery.....	For 10 days indefinite symptoms when lumbar puncture established diagnosis.
5	1-28-18	Positive.....	Comatose, 24 hours; delirious, 48 hours....	14	17	2d	25	Psychosis; right orchitis.....	Meningitis recovery; psychosis unimproved.	Psychosis (dem. praecox) set in March 16, 1918. Still in hospital for psychosis.
6	1-28-18	Positive.....	Comatose; Kernig's and Brudzinsky's positive.	10	14	2d	37	None.....	Recovery.....	Severe headache before he became comatose. Course uneventful.
7	1-28-18	Positive.....	Headache, chill, slight rigidity of neck, Kernig's positive.	4	4	6th	33	Serum disease on tenth day.	Recovery.....	Diagnosis 5 days after admission by lumbar puncture.
8	1-28-18	Positive....	Violent chill day before. Pain in neck; Kernig's positive.	6	11	2d	6	Blurred vision.....	Death.....	Fulminating type. Thought to have pneumonia on account of chill and temperature, but lumbar puncture cleared up diagnosis.
9	1-31-18	Positive....	Severe headache 2 days before; muscles sore.	10	11	3rd	34	Right eye blind; left 20/70..	Meningitis recovery; eye unimproved.	Lumbar puncture established diagnosis. "Eye condition of nerve origin(?) in back of retina. (Amaurosis.)" (Captain Heard.)
1	2- 5-18	Positive....	Comatose; Kernig's positive.	6	8	1st	48	Pain in left ear, pain in legs; serum disease on 15th day.	Recovery.....	Delirious 3 days. Uneventful recovery.
11	2-10-18	Positive.....	Headache; pain over body (3 days before). Relapse of meningitis, 3-13-18.	4 4	6 4	3rd	110	Conjunctivitis; bones joints and muscles of leg ache; serum disease on 7th day of treatment for relapse.....	Recovery.....	On 3-11-18 return of the meningitis symptoms. On 3-13-18 lumbar puncture and serum administered. Left on furlough 6-12-18 in good condition.
12	3-30-18	Positive....	Headache, occipital, stiff neck, vomiting, Kernig's positive (for last 3 days).	5	2	4th	62	None.....	Recovery.....	Course uneventful.
13	5-16-18	40 c.c. very turbid, negative for bacteria.	Headache, stiff neck, Kernig's positive. (Started 4 days prior.)	7	2	5th	23	None.....	Recovery.....	Most rapid recovery in whole series. Posterior nares negative to meningococcus. Blood sterile.

THE PLACE OF PATHOLOGICAL ANATOMY IN MILITARY MEDICINE

By JAMES EWING

Contract Surgeon, Army Medical Museum

(With one illustration)

THE essential importance of pathological anatomy as a basis for medical and surgical practice and research is everywhere conceded, but probably nowhere fully heeded. Although medicine is distinguished from the medical cults by nothing so much as by the reliance placed upon the anatomical lesions of disease, yet an accurate knowledge of what disease does in the body is certainly not possessed by the majority of regular practitioners. Even in the most modern medical schools the curriculum does not permit the student to become familiar with the innumerable gross lesions of disease, and the material available would not permit it if the curriculum did. At a recent examination held by the National Board it transpired that none of the candidates and few of the examiners had ever seen the liver of eclampsia, although hemorrhagic hepatitis is one of the most striking and significant gross lesions occurring in the human body.

In the modern highly equipped university clinic it is commonly assumed that the chief has, of course, acquired competence in such fundamental matters as pathological anatomy, but the record does not always show how he acquired this knowledge, and investigation often reveals that this branch of the work of the clinic is in charge of some young assistant who is not always marked for rapid advancement.

Even among pathologists there is a wide divergence in the extent to which pathological anatomy is cultivated, as a basis for teaching pathology or as a means of research. Very often it is assumed that gross pathology is such an old subject that the cream has been skimmed from it and that no important additions to our knowledge are to be expected from it, and certainly no sensational rewards.

Chief among the reasons for the present decline of pathological anatomy in America is the difficulty of securing material for study. The proper performance of an autopsy is a difficult, laborious, expert and time-consuming procedure. It involves a peculiar knowledge of normal anatomy, technical skill, a systematic and yet adaptable procedure, attention to microscopic, bacteriologic, and chemical data, wide acquaintance with the lesions of disease, broad

knowledge of medicine, and acquaintance with technical language. The opportunity to perform autopsies is hedged about by an unintelligent attitude of the public, by antiquated laws, by inadequate facilities, and by the conflicting interests of anatomists, undertakers ecclesiastics, burial societies, and other friends. In New York City it is a misdemeanor to remove organs from the body in municipal hospitals, and thus properly to teach pathological anatomy.

To the believer in the renaissance of pathological anatomy two hopeful signs appear on the horizon. One is the approach of state medicine, and the other is the demand for military medical efficiency. The moment that the sponsors of either of these movements begin to analyze the elements of real efficiency in the knowledge and practice of medicine, that moment a high development of pathological anatomy is assured.

The reason why pathological anatomy has had such a fundamental influence on the progress of medicine and is so essential to the practitioner lies in the fact that tissue changes detected by the naked eye had interpreted by microscopic control are just those that produce the significant symptoms of disease and, as a rule, determine the main events in its course. It is only upon a sound basis of pathological anatomy that the bacteriologist, chemist, and serologist can safely proceed to trace the finer factors in the causation and pathogenesis of disease. It is a matter of historical record that while it has been the task of the clinician to point out the clinical problems of medicine, it was first the gross pathologist who found how these problems were to be attacked. Thus when Virchow, seventy years ago, pointed out that in uremia, lesions of the liver were quite as prominent as those of the kidney, he placed the problem of Bright's disease on the doorstep of the physiological chemist. For many years before attention centered on the pancreas in diabetes, pathological anatomists had emphasized the nearly constant occurrence of lesions in this organ, and only recently has the simple morphological study of the organ established the importance of lesions in the islands, and justified the pursuit of the pancreatic hormone. Even with the infectious diseases it is a rule that a specific microörganism, producing specific clinical symptoms, causes also characteristic gross anatomical lesions which in turn present a peculiar histological structure, and while, with some exceptions, the fever and intoxication are of general origin and of non-specific character, the grosser anatomical lesions determine the main clinical features of the disease. Some may not concede such central importance to pathological anatomy, but I

venture to think that the above estimate is not overdrawn, and could be supported by very numerous additional data drawn from all departments of medicine.

The importance of pathological anatomy in the Army Medical Service has been plainly illustrated in many ways.

When the demands of the war suddenly developed and it became necessary to equip a large number of laboratories with a competent personnel, it was soon apparent that American laboratories had been manned chiefly by clinical pathologists, while the supply of expert pathologists was quite inadequate.

When a large new Army Medical School was established at Fort Oglethorpe, the effort to secure pathological material for teaching purposes soon revealed that there was no excess material of this sort, and that it was difficult to secure.

When epidemics of pneumonia and meningitis broke out in cantonments the best opinion was unable to decide whether the disease was exhibiting new or only old features, because there was no opportunity to compare the lesions on a large scale with those previously observed. Neither clinicians nor pathologists of today remember the details of the influenzal lesions of 1889-90, and nowhere have these lesions been properly preserved. If there is, in America, any collection of post-measles pneumonias, or any physician thoroughly acquainted with the details of such lesions, it was not apparent in the exigency of last winter.

When the treatment of infected war wounds became the most urgent surgical problem, the solution was reached on the basis of the grossest of pathological anatomical grounds, namely, the excision of wide areas of devitalized muscle. It is now apparent that a few careful dissections of these wounds would have revealed to the naked eye the extent of the devitalized tissues, the dissemination of bone fragments, and the real problem of surgical treatment. The question of when to amputate or save infected fractured limbs seems to have been influenced strongly, at least in British circles, by the amount of damage to heart and kidneys revealed at autopsy on prolonged cases of suppuration or after less stormy wound healing.

Such considerations as the above early led our British confreres to recognize the importance of studies in gross pathology in the elucidation of military medical problems, and to appoint a committee of experts to develop the field of pathological anatomy and museum demonstration. An impressive exhibition of some of their results was recently held in London.

Likewise our own Medical Staff, with somewhat less definite evidence of its necessity, and with correspondingly greater foresight, many months ago formed plans to collect all the pathological material from the army hospitals, at home and overseas, and to form a new Army Medical Museum at Washington. The objects of the collection were conceived to be:

1. The gathering of the objective records of the effects of disease, from which might be written an important chapter in the medical history of the war.
2. The employment of pathological anatomical studies in the solution of current military medical problems.
3. The formation of a permanent museum.
4. The use of the material for the education of military physicians in the diseases occurring in the Army.
5. The later study, both gross and microscopic, of large numbers of cases, for their general scientific and special military interest.

At the present time it seems desirable that those who are interested in the undertaking should be apprised of the degree of success thus far attained, of the general objects, methods, and possibilities of the project, so that during the remaining period of post-bellum activities every effort may be made to bring the project to complete success.

It is necessary to admit that thus far, while much valuable material has been collected, and much more is stored in hospital laboratories, the indications are not entirely reassuring that the American Army Medical Staff will have in its possession at the end of the war period a satisfactory collection of pathological material from which to write the medical history of the war, and it appears even less certain that this material will permit the formation of a museum which is abreast of modern standards. A frank acknowledgment of this situation seems to be its most likely remedy.

Prominent among the causes of this partial failure has been the great haste demanded in the military preparations, which had to be the first consideration. The outbreaks of infectious diseases in the camps, although probably not more severe than with some of our allies, threw a vast amount of emergency work upon the laboratory staff, and made it impossible to attend to the many details of preparation and collection of pathological specimens. Even more important was the paucity of men trained in the methods of the pathological laboratory, as distinguished from the clinical laboratory. a defect that must be charged against the present organization of American civil medicine. The war definitely demonstrated

that there is shortage of pathologists and pathological facilities in America, while clinical laboratory diagnosis is rather highly developed.

Finally, while there is in America an association composed of rather numerous pathologists interested in museum work, their standards and propaganda have not yet penetrated widely, so that the prevailing notions, at least among the clinical pathologists, of what constitutes a museum specimen are quite vague. Even among pathologists, in and out of the Army, there is a divergence in ideas and practice regarding museum preparations. The spirited inquiry has been made whether an autopsy is performed to settle important questions at the autopsy table, or only to secure museum specimens. On this point it is of first importance to come to an understanding. The writer has no hesitation in affirming that both the above objects should be considered in performing an autopsy, but that the destruction of a valuable museum specimen for the sake of a hasty demonstration, especially in the case of an American soldier, should be deprecated. If the Army Museum is to take a creditable form, the army pathologist must resolutely refuse to damage gross anatomical specimens, but, on the contrary, must use all his ingenuity to preserve in natural form and color a reasonable or even a large proportion of the lesions that come under his hands.

The importance of collecting museum material being recognized and the means provided, the question remains: How extensive shall this collection be, and what methods shall be employed in gathering it?

Those who conceived the plan of creating a new pathological museum believe that all material obtained in the army service should be sent to Washington, and orders to that effect were given out some months ago. If these orders are rigidly followed, it appears certain that much material of little or no value will accumulate. Yet the responsibility of throwing specimens away can best be assumed by a central office. A few tonsils in a camp laboratory may be of little interest, but a thousand gathered from many sources would serve to determine what significance the tonsil has in military service.

The same rule applies to all the specialties. The histopathology of cutaneous diseases may be a threadbare subject, but the Army needs such a collection for several purposes. Or it may prove that there are still some new facts to be elicited by the study of lesions of the skin, especially those due to poisonous gases and burns.

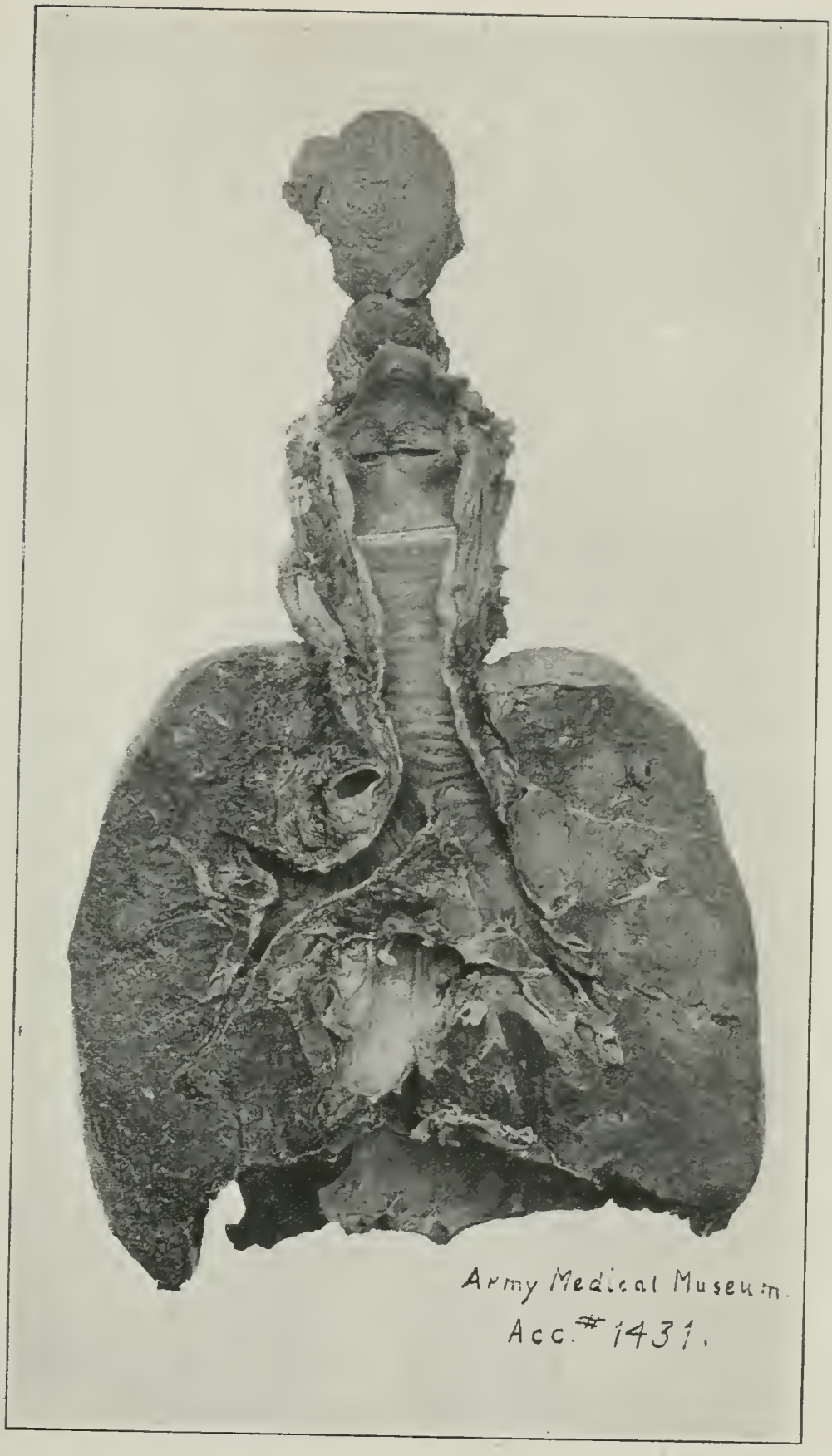
In the case of general diseases the scope of the material which

it is desirable to include in the museum collection will vary in the opinions of different pathologists. Yet if any competent and systematic study of diseases such as pneumonia, measles, and influenza, is to be undertaken, portions of all the organs, and not merely the main lesion, must be preserved for histological examination. Exactly the same rule would seem to apply in the preservation of gross material for museum demonstration. The idea of exhibiting in natural form and color all the affected organs in a series of cases of the important diseases occurring in the Army may appear unreasonable or even grotesque. It is a fact that it has never been accomplished. Nevertheless the writer believes that the time has come when the full possibilities of museum demonstration—for record, for education, and for research—should be recognized, and a strong effort made to realize them in the new Army Medical Museum. Such an undertaking would call for new standards in gross pathology, but the war has brought new standards in nearly every other branch of medicine, and why should not pathological anatomy be allowed to take a step forward?

The pathologist is commonly content to save a portion of one lung in pneumonia, put it in a glass jar, and use it as a text on which to discuss the pathogenesis of the disease. The extent of the pulmonary, bronchial, and pleural lesions, and the highly important changes in the other organs are left to the imagination. Yet it is just these peculiar associated lesions, so difficult to describe and correlate, that render the picture significant and impressive. On the old basis, pathological museums, interesting enough in themselves, have never assumed the importance they deserve, and have never fully discharged their functions.

No better proof of the necessity of presenting the whole picture of the disease could be found than has just appeared in the recent epidemic of influenza. The urgent question arose whether the disease was new or had been seen before. This question, not solvable on the available bacteriological evidence alone, could have been decided by a close comparison of the peculiar lesions occurring in the lungs and other organs in October, 1918, with those observed in the winter of 1917-18. As observed in October, these peculiar features included the hemorrhagic lesions in the lungs and respiratory tract, the hemorrhagic gastritis and enteritis, and the alterations in the hemopoietic organs, all of which were required if the picture were to be in any sense adequate and conclusive.

On this account the following scheme of procedure was prepared at the Army Medical Museum and recommended to a few neighbor-



LESION OF RESPIRATORY TRACT IN INFLUENZAL PNEUMONIA

(To face page 276.)

ing hospitals. It is presented here, not only for its immediate relation to influenza, but as representing the object to be attained by the museum pathologist in dealing with other diseases. That object should be to preserve the whole picture of the disease.

ARMY MEDICAL MUSEUM

PROCEDURE RECOMMENDED FOR THE PRESERVATION OF MUSEUM MATERIAL IN CASES OF INFLUENZA

Save the Whole Picture of the Disease.

Use Klotz's fluid, Kaiserling's, or 10 per cent formalin.

Respiratory organs.—Remove both lungs together, and with them, if possible, the tonsils, larynx, and trachea.

Make bacterial cultures from posterior surfaces of lobes.

Gently distend the lungs to normal dimensions by pouring fixing fluid into trachea. Wait one or, better, twenty-four hours before incising.

Lay out lungs on their anterior surfaces, and with a long knife bisect the bronchial tree to the second bifurcations, continuing the incision and removing in the same plane one to two inches of the posterior portions of the parenchyma, from apex to base.

Save the smaller portions for histological study, and float the other in a large container.

Stomach.—Half fill the stomach with fixative, float in a large container, and after 24 hours incise along middle of anterior surface. Treat similarly affected portions of small and large intestine.

Spleen.—Bisect in long diameters.

Liver.—Preserve a transverse segment 2 inches thick.

Kidneys.—Bisect with adrenals and preserve one half.

Bone marrow.—Remove a portion of sternum and body of one vertebra. The head of the humerus in adults does not usually contain red marrow.

Objections to the prominence thus given to pathological anatomy will arise from the requirements of the bacteriologist, from the considerable demands on the time of the laboratory staff, and from the respect due to the dead body.

Yet the bacteriologist need not cut the lung to pieces to obtain cultures. He can make sterile punctures at as many points as desired. In fact it seems not impossible that the complex bacteriology of the pneumonic lung might be simplified by coöperation between pathologist and bacteriologist, identifying and isolating the numerous secondary lesions and infections that occur, and possibly by assigning dfferent organs to different purposes.

The labor of preparing organs for gross demonstration is considerable, and special experience and skill are required, so that it would seem desirable to provide a special laboratory assistant part of whose time should be devoted to this work.

As a rule, no unusual procedures are involved at an autopsy performed with full attention to museum requirements.

As with pneumonia, so with other diseases, the objects of an autopsy should include the preservation of the whole picture of the disease. In not a few instances this result has already been attained by army pathologists, who have sent to the museum very complete series of lesions illustrating certain maladies. Thus, in a case of malignant endocarditis, the organs include the heart with ulcerated valves, lungs with broncho-pneumonia, spleen and liver with infarcts, and kidneys and intestine with petechial hemorrhages.

In a group of cases the lesion extends by continuity through many organs, and its demonstration requires an elaborate dissection. The museum staff is prepared to make such dissections. In a case of thymic tumor involving mediastinum, lungs, liver, mesentery and peri-renal tissues, the organs were received *en masse*, and by a laborious dissection the anatomy of this condition is displayed in a highly interesting and instructive manner. In a case of Addison's disease the abdominal organs were received *en masse*, and a minute dissection of these organs, with lymphatics, sympathetic system, and adrenals, reveals in a most impressive way the distribution of a caseous tuberculous lesion. This specimen is a unique contribution to the anatomy and pathogenesis of Addison's disease.

In certain cases the material to be saved will be suggested by the pathologist's knowledge of research problems of current interest. Diseases of the endocrine system suggest attention to all the organs of this system. The anatomical signs of status lymphaticus are of very general distribution. No one would fail to examine representative portions of bone marrow, chains of lymph nodes, and the several tissue lesions in leukemia.

Attention may be drawn here to the importance of studying the anatomical changes in any limbs amputated in reconstruction hospitals, since it appears probable that the knowledge thus gained may guide the orthopedist in devising operations and apparatus for the treatment of these cases.

Today it is not sufficient, as it was in Civil War time, to illustrate infected fractures by means of a dry bone specimen, for equal or greater interest attaches to the changes in the soft parts and, in fatal cases, to such complications as endocarditis, fat embolism, and nephritis.

Regarding the methods to be employed in the preservation of museum and histological material, reference may be made to the

Circular of Information sent to army hospitals last September. The essential factor which makes it possible for the modern pathological museum to present the exact condition of diseased organs is the blood-preserving property of formalin. When the blood is hemolyzed no method as yet devised gives satisfactory preservation of color. One who knows how to use formalin can obtain almost as good results with a 10 per cent solution as with any of the more complex fixatives, but the care required is somewhat greater than with Klotz's or Kaiserling's fluids. Gross specimens should not remain in formalin more than two or three days, they should then be washed in running water, color restored in alcohol for 24 to 48 hours, and preserved in the final fluids recommended by Klotz or Kaiserling, paraffin oil, or sugar solution. The great advantage of Klotz's fixative, No. 1, is the fact that specimens may remain and be shipped in it. As with most other technical problems, the skill, patience, and ingenuity of the pathologist will always be taxed to secure desired results.

Although the war is over, there will still be abundant opportunity for the army laboratories to employ the best methods and aim at the highest standards of pathological anatomical preparation. In fact, as the stress of military activity lessens, the situation becomes more favorable for attention to the interests of museum collection and the study of medical problems arising from the war.

It may be emphasized that the Army Medical Museum is equipped to make the best use of an extensive museum collection. With a staff of experts in plaster and wax modelling, painting, photography, and anatomical preparation, it is capable of employing every branch of pictorial art on the material received, and thus to become a powerful factor in medical education. In the remaining period of military mobilization, a concerted effort should be made to gather at Washington a complete and modern pathological collection. If such a result can be accomplished, it will give a powerful impetus to the study of pathology and distinctly elevate the standards of medical education and practice, both in the Army and throughout the country.

EDITORIAL

TREE BOXES

When the editor first came to Washington in 1876, the streets were in many places cañons inclosed by high clay walls as a result of the grading carried out by "Boss" Shepard, and these same streets were lined by slender shoots of trees. For their protection, all were encircled by clumsy wooden frames known locally as "tree boxes." As the saplings grew and increased in the three dimensions the need for protection disappeared, as did also the tree boxes. What had been formerly a precarious existence, needing every fostering aid, became able to stand by itself, to withstand buffets and to present a dignity and a gracious and grateful shade to withered humanity in the scorching days of Washington summers.

The rather whimsical idea has occurred to us that our own service, the profession of medicine, both within and without the branches of the service, has been through much the same experience.

We began in velvet cloaks liberally besprinkled with the signs of the Zodiak and were kin to the mysticism of the astrologers. We were tradesmen when we were barber surgeons and wound our bloody cloths around the poles outside our doors.

From a good deal of charlatanry and a great deal of ignorance, we have grown along the avenue of the years gaining in height and breadth until now we stand by ourselves and the shade of our knowledge serves as a shelter for our fellows who are subjected to the fierce heat of illness or injury.

The "tree boxes" which have protected us as we have gained in strength and stature have been the discoveries of the patient seekers after truth, the advances which have translated medicine from a species of scientific guesswork to one of the exact professions.

It is hardly necessary to enumerate them for they readily suggest themselves to any practitioner of medicine who casts a reflective eye back along the road which has led from medievalism to modern methods. They have not been all military triumphs, any more than all doctors have been soldiers. The breadth of our calling has been such that the mantle of our skill has been available for all mankind, whether in uniform or fustian.

If we follow the "tree boxes" further, we may note the substitution of the ligature for cautery in the stopping of hemorrhage: the

work which Lister began; the various measures based on the recognition of the fact that disease is germ-borne, which has made the plagues which swept the armies of former times a matter of wonderment to us of greater knowledge.

Each step along this road out of groping knowledge into the light of scientific achievement has been one of the "tree boxes" which has allowed the slender shoot of medical lore to expand until today we may perhaps fairly claim that we are big enough to withstand adversity without these props. We do not mean that we have arrived at the point where no further growth is probable, but that now the tree is large enough to require mainly careful care, attention, pruning of the withered and badly shaped branches, and that with these aids we may hope to continue in our expansion. We are large enough to discard the closely sheltering protection which was necessary to give us time to grow. That it is taken away does not mean that we shall cease to flourish and grow stronger, and each year give shade and shelter to a larger number of those who turn to us for aid and comfort.

The present war has done much to aid us in our growth. When we turn the pages of military medical history back twenty years, we find that we had camps ravaged by typhoid, and in our brief experience in the field of combat there was much to be desired in our *modus operandi*. Going farther back in the record, to our Civil War, we find that our corps, while it cared for the sick and wounded, did so in a manner which, in the light of present-day procedure, would send a shiver down the back of any man trained to modern methods.

This is no detraction from the loyal self-sacrifice of the untiring men who labored with the best they had to mend their fellow-men; it is merely further evidence of what the "tree boxes" have done for our tree of knowledge. From '61 to '65 there was but one policy in respect to shattered limbs, that of immediate amputation, lest the dreaded gangrene finish forever the life of the wounded soldier. Contrast that with the surgery of today where the whole cry is conservation, and it will be entirely evident where we substituted a larger "tree box" to meet our growing needs.

If we embroider the fancy a little further, it seems as though we could say that now, in addition to furnishing shade and shelter to suffering humanity, we may claim that we have come to the stage where, in the economic scheme of the armed forces, we bear very substantial fruit.

By this we desire to call attention to the fact that, while in former times the chief function of the medical service was to relieve the sufferings of those who had fallen in conflict, to help them back to a remnant of crippled existence, we have today, by the advantage of advanced methods and exact procedure, changed what was formerly mainly a service of succour to a service of salvage. This must be apparent to anyone who has given thoughtful study to the statistics of any of the nations in the present war.

Battles cannot be fought without men, nor can they be waged without casualties. The ultimate conclusion of this is that when there have been enough encounters to incapacitate all the effectives, the nation so affected must of necessity be conquered. Recognizing this fact early in the present struggle, each of the combatant powers bent every energy to the conservation to the state of all who might in any way be of further service in the front line or in the services farther to the rear. We have seen it stated somewhere that in the time of Great Britain's shortage of men, toward the latter part of the war, a "recombing" of the men who had been invalided as unfit for further service resulted in a return to "Class A" (fit for any service) of 80 per cent of those surveyed.

A result of this kind changes a service which is primarily believed to be merely one of personal succour to the individual into a very important factor in the winning of battles by the means of reinforcement by man power. It places the Medical Department, from a purely commercial standpoint, on the same plane as those departments which take over worn-out or damaged equipment, of whatever sort, and put it out as serviceable for further use.

There have been numberless instances of attacks on hospitals by the Huns—attacks made apparently with all knowledge of the character of the target shelled or bombed; stories of the attempted assassination of medical officers by prisoners or wounded. We cannot vouch personally for the truth of any of these, but in view of other atrocities which we *did* see in Northern France they do not seem unlikely as an index of the German military program. As an explanation of these violations of the Convention, the reason was quoted that while, under former conditions, a doctor was a man who preserved for the individual the shattered remnant of his physical self, under the highly developed, specialized system of today he was a factor which was responsible for a large percentage of the replacement of the fighting force. That is to say, the killing of *one* medical officer was not merely the extinction of life in one of the

enemy force, but the abolition of his power to put back as effectives a certain number of those who had been placed *hors de combat* through attack and assault.

Viewed in this light, we think it not unjust to claim that we should be judged by the state not only by the standard of those who bring relief from pain, and ease from suffering, but by the broader one of a very material and essential service of reclamation and replacement.

Just what percentage claim we may make in this way cannot be known until the statistics of the war have been marshalled in orderly sequence, but it seems assured that our place in the scheme of war is a more important one than has heretofore been ascribed to us.

To anyone with a free fancy, this idea of the "tree boxes" offers a long flight, far into the days to come, when many of the problems which now beset us shall be as certainly solved as have been those which have troubled us in the past.

With this war has come one thing which will make for our faster and more sure advancement in our work; that is, the increased measure of confidence which our brothers of the line have given us as they have become cognizant of the extent to which we may be of material assistance to them. This will help us in our further striving for better methods, and, while we may now have outgrown our need for the "tree boxes" which sheltered us in our infancy, the spur of friendly and understanding criticism will help to broaden our branches and set the roots of our knowledge more deeply in the soil.

JAMES ROBB CHURCH.

SIR DOUGLAS HAIG'S DISPATCH ON THE MARCH RETREAT [1]

The following extract from the *British Medical Journal* is evidence of the appreciation by the "C in C" of the value to him of his Medical Service. Commendation from such a source must necessarily be gratifying not only to the service praised, but to us of the profession, no matter in what branch we be, nor for that matter whether we be in any branch. The most difficult task which an army has to perform is one involving retirement from a position. Possibly it is as hard for the Medical Department as for any other branch of the service when we consider that they, in addition to removing the amount of matériel which is requisite for the care of

[1] *British Medical Journal*, October 26, 1918, p. 475.

the wounded, must also transport to a place of safety many men who are not fit for travel. The smooth and successful accomplishment of this is worthy of the praise which Sir Douglas Haig has bestowed.—J. R. C.

The dispatch, dated July 20, of Field Marshal Sir Douglas Haig, Commanding-in-Chief, British Armies in France, issued by the War Office on October 21, deals with the period from the end of the actions near Cambrai in the first week of December, 1917, to the end of April, 1918, and thus covers the retreat caused by the German thrust which began on March 21. The concluding paragraphs of the dispatch refer to the enormous amount of additional work thrown upon the different branches of the staff and upon the administrative services and departments, including the evacuation of great masses of stores, hospitals, rolling stock, non-combatants, labor units, and civilians from the battle area, and the supplying of the troops in constantly changing places with food and ammunition. The work was carried out smoothly and successfully in circumstances of extraordinary difficulty, and there was never any lack of food or ammunition for the troops. The following is the text of the paragraph relating to the medical services:

"Much additional work, also under circumstances of unusual difficulty and danger, has necessarily been thrown upon the medical and nursing services. The conduct of the Royal Army Medical Corps and Medical Corps of the Overseas Dominions has again been beyond all praise, while the efficient organization of the medical services as a whole proved itself fully equal to the occasion. I take this opportunity to acknowledge the lasting debt due in this connection to Lieut.-Gen. Sir A. T. Sloggett, K.C.B., K.C.M.G., K.C.V.O., K.H.S., until recently Director-General of Medical Services, with whom the work of the medical services has so long been identified."

COMMENT AND CRITICISM

THE MEDICAL HISTORY OF THE WAR

1. *Retrospective.*—The first example of a medical and surgical history of any war was the Medical and Surgical History of the Crimean War, 1854-56, published by the British Army Medical Department in 1858. This history owed its inception to military necessity. Andrew Smith, Director-General of the British Medical Department during this period, states in the preface of the work that in his preparation for the campaign he searched the records of previous wars in vain for data which might be of use or value in the care of the sick and wounded during the prospective war. He found, he says, "only two or three valueless documents" indicating the number of Staff Medical Officers serving in Spain during the few months of 1812.

> The doubts and indescribable anxieties which resulted from the absence of all details calculated to instruct, under existing circumstances, led me early to determine that my successor should, provided I continued in office till the termination of the war, never have to encounter the many difficulties and perplexities which had fallen to my share.

He therefore proposed to the Minister of War and the Commander-in-Chief that a *précis* or descriptive index of all letters bearing on matters relating to the army between February 11, 1854, and the final evacuation of the Crimea after the restoration of peace be prepared; and that an analysis of all professional documents forwarded from the front by medical officers and relating to the status of medical and surgical cases treated in the war, be made. This *précis* was published as two folio volumes of 769 and 707 pages, respectively. This was followed by the two volumes of the Medical and Surgical History (559 and 480 pages, respectively). There were also a Report (with appendix) on the supplies of the British Army in the Crimea (1855) and two Reports on the state of hospitals in the Crimea and Scutari (1855) and the regulations affecting the sanitary condition of the army, the organization of the hospitals, and the treatment of the sick and wounded (1858), making, in all, eight folio volumes relating to the British Medical History of the Crimean War.

Smith says that the experiences of the British Army during the first year of the Crimean War, with the terrible set-back from cholera and other infectious diseases, shows very clearly how much

the British Army would have profited by the medical histories of former wars had any records of the same been available.

The History of French Participation in the Crimean War was written by J. C. Chenu, a volume of 732 pages appearing in 1865, nine years after the event; and the very brief account of Russia's participation, a thin pamphlet, by C. von Hübbenet, was published in Berlin in 1871, fifteen years after the conclusion of the war.

During this long interim period, the Medical and Surgical History of the War of the Rebellion was begun in 1862, and volume one of the medical and surgical series had already been published in 1870.

The genesis of this history was as follows: On May 21, 1862, Surgeon General William A. Hammond took steps to secure important modifications in the returns from medical officers in order to obtain more detailed and exact reports of the sick and wounded.

On June 9, 1862, a circular from the Surgeon General's Office announced the intention of preparing a Medical and Surgical History of the War. And, on June 4, 1862, Surgeon J. H. Brinton and J. J. Woodward had been ordered to duty in the Surgeon General's Office in order to carry on this work.

The first interim publications in this direction were: A Consolidated Statement of Gunshot Wounds (July 1, 1863), by Surgeon J. H. Brinton, then Curator, Army Medical Museum, and Custodian of Surgical Records; and a Report on Sickness and Mortality of the Army during the First Year of the War (September 8, 1863), by Asst. Surgeon J. J. Woodward, then in charge of Medical Records.

The returns of the sick and wounded were revised and improved by various circular orders, viz., A. G. O. No. 25, November 4, 1863; S. G. O., January 20, 1864; March 23, 1864, March 28, 1864, and February 2, 1865.

On May 21, 1862, Circular No. 2, S. G. O., announced the intention of establishing in Washington an Army Medical Museum, and medical officers in the field were ordered "diligently to collect and to forward to the office of the Surgeon General all specimens of morbid anatomy, surgical and medical, which may be regarded as valuable; together with projectiles and foreign bodies removed, and such other matters as may prove of interest in the study of military medicine or surgery. These objects should be accompanied by short explanatory notes. Each specimen in the collection will have appended the name of the medical officer by whom it was prepared."

On August 1, 1862, Surgeon J. H. Brinton was ordered to collect and arrange these specimens in the "Military Medical Museum," thus becoming virtually its curator. The concluding sentence of the Surgeon General's order to Brinton reads: "Should any medical officer of the Army decline or neglect to furnish such preparations for the museum, you will report the name of such officer to this office." Brinton secured the assistance of Hospital Steward Schafhirt and his son, who had formerly worked under Dr. Joseph Leidy in preparing and mounting specimens. The Army Medical Museum was first started in the rooms on the first (and later second) floor of the Riggs Bank, and was then moved to a second story back on Pennsylvania Avenue, later to Corcoran's Schoolhouse (Art Gallery) on H Street beteen 13th and 14th Streets (June 1, 1863). In these buildings Brinton and Woodward built up the Museum Collection, compiled the reports of the sick and wounded, and carried on the preliminary work for the Medical and Surgical History of the War, with the assistance of a sufficient clerical personnel. After the assassination of Lincoln, the Army Medical Museum and Library were moved to the old Ford's Theater on 10th Street, and at last found a permanent home in the present building on 7th and B Streets, S. W., in 1887.

Brinton says, in his Personal Memoirs, that he was minded to preface the professional matter in the surgical portion of the history—

> with a sort of semi-historical or semi-military account or history of the military movements. I hoped thus to convey some idea of the circumstances attending and influencing the medical and surgical treatment of our sick and wounded, to describe the condition of the soldier during each campaign, his physical surroundings, his marchings, his state of health, the general character of the action in which he might have been wounded, the character of the field hospitals and transportation, in fact, the hygienic conditions of the soldiers, as far as I could ascertain them, so that future readers might learn something of the men in health as well as in disease.[1]

This ambitious program, the merits of which are obvious, was never carried out. On September 29, 1864, Brinton was relieved from duty in the Surgeon General's Office, and Assistant Surgeon George A. Otis, his successor, was assigned to take charge of the Surgical Records on October 3, 1864.

Concerning the methods employed in collecting pathological specimens and medical records, Brinton says:

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[1] J. H. Brinton: "Personal Memoirs," New York, 1914, pp. 172.

Any account of the museum would be incomplete without some description of how the specimens were obtained and gathered up, and by what system they passed from their original possessors to the museum. First of all, the man had to be shot, or injured, to be taken to the hospital for examination and, in a case for operation, to be operated upon. If all this were taking place in a city hospital or a permanent general hospital, the bones of a part removed would usually be partially cleaned, and then, with a wooden tag and carved number attached, would be packed away in a keg containing alcohol, whiskey, or sometimes salt and water. Then, when a sufficient number of specimens had accumulated, the keg would be sent to Washington and turned over to the Army Museum, where the preparations of the specimens would be finished, so that they could take their place upon the shelves. The memoranda or histories of these specimens would in the meantime have been forwarded to the Surgeon General's Office, and, after having been fitted to objects and their truthfulness assured, would be entered in the books of *Histories of Specimens*, preserved in the Museum, and under the care of the Assistant Curator.

One of the chief difficulties at this time was that of procuring truthful and full histories of the specimens. When these were derived from hospitals, where the patient had been under observation, it was possible to obtain a history of the case, especially where the medical officer in charge of the hospital or bed felt a true professional interest in furnishing reliable data and in contributing what he could to the common stock of surgical knowledge. It was one of my main objects in visiting the various hospitals, and generally the military medical centers, to develop as far as I could this interest in the museum, to make its objects and tendencies known, and to lead all medical men, from the highest to the lowest, to know and be convinced that the formation and foundation of a great National Surgical and Medical Museum was not for the collection of curiosities, but for the accumulation of objects and data of lasting scientific interest, which might in the future serve to instruct generations of students and thus in time be productive of real use.

Many of our Army surgeons entered into the scheme of the museum with great zeal and earnestness, but some few there were, and these mostly the least educated, who failed to see its importance. But in the course of time a belief in the importance and value of the growing museum spread throughout the army, and an active and faithful coöperation was elicited from the medical staff generally. The publication of the first catalogue in January exerted a good effect, and the opening of the museum to the public, and especially to medical visitors, was not without its influence.

In the case of field hospitals, after great battles, it was at first difficult to get our system to work. The number of operations was so great, the medical force (I mean the intelligent skilled force) was comparatively so weak and overworked, that it seemed at first almost impossible to obtain from them the preparations we desired. It was hard enough to be worked day and night in those great surgical emergencies accompanying fierce and protracted battles, and it really seemed unjust to expect the rough preparation, necessary to preserve for the museum the mutilated limbs. These were usually buried in heaps. To overcome all these difficulties and to set an example, I visited frequently our battlefields, as soon as the in-

formation was telegraphed to Washington. I then saw not only a great deal of active surgery, but I had the opportunity of showing practically to the operating surgeons, and to their assistant staffs, what it was that we really wanted and how their part could be accomplished with the least amount of labor, and in the most satisfactory manner. Many and many a putrid heap have I had dug out of trenches where they had been buried, in the supposition of an everlasting rest, and ghoul-like work have I done, amid surrounding gatherings of wondering surgeons and scarcely less wondering doctors. But all saw that I was in earnest and my example was infectious. By going thus from corps hospital to corps hospital, a real interest was excited as to the Museum work, and an active coöperation was eventually established.

Early in January, 1863, I published, under Dr. Hammond's order, a small catalogue of the Army Museum up to that time, showing a collection of 1,349 objects, of which 988 were surgical, 106 medical, and 133 extracted projectiles. This catalogue was as accurate as I could then make it. Its real object was to give credit to all medical officers contributing to the museum. In fact, it did a great deal more; large numbers of preparations had accumulated in the museum, the donors of which were not known. Very many specimens I had brought there from the battlefields, collected by myself. These I put into the first catalogue, assigning them to such medical officers as I could call to mind, and especially to those whom I knew to be lukewarm in museum interests. The effect of the procedure was good.

Once established, the museum was rapidly enlarged and extended. A section of models was established, of ambulances and litter, of horse and mule transportation of wounded, or transportation by railway and by boat, of hospital wagons and tents for the field, of tent hospitals, great and small, and of large general hospitals. All these were shown as found in different sections of the country, in the west and east, in the front, and in the rear of active operations.

The machinery to carry on the museum was very simple. A full photographic outfit and the employment of a corps of artists was also ordered about this time, and did notable service in illustrating the museum specimens. Artists were obtained by enlistment as hospital stewards, and were assigned to duty in the Surgeon General's Office at the best pay a headquarters' detail could give. I had at this time a topographical artist to draw the maps for the history of the war, one or two water colorists, who would also paint in oil rapidly if required, and the bone-preparers, the Schafhirts, father and son. At a later period, just before I left the Surgeon General's Office, the services of one or two photographers were obtained, and a studio and workroom was established at the Army Museum building.[2]

On November 1, 1865, Circular No. 6, S. G. O., was issued by authority of the Secretary of War, being "Reports on the extent and nature of the materials available for the preparation of a Medical and Surgical History of the Rebellion, by George A. Otis and Joseph J. Woodward." This was a quarto volume of 166 pages

[2] J. H. Brinton: "Personal Memoirs," New York, 1914, pp. 185-189.

and 5 plates, and indicates that the preparation and redaction of the historical material had been very efficiently managed and pushed forward during the period June, 1862, to November, 1865. An edition of 7,500 copies of this publication was distributed.

On April 6, 1866, a circular letter was addressed to each medical director in the field, ordering that all registers of hospitals, consolidated registers of soldiers treated, and all information pertaining to the sick, wounded, discharged and dead during the war be transferred to the Surgeon General's Office. Thus the whole mass of available material came under the final control of Woodward and Otis.

Through the influence of Secretary Stanton, an application for appropriation to publish the work was made to Congress. On June 8, 1868, a Congressional appropriation was finally granted to prepare for the publication, under the Secretary of War, of 5,000 copies of the first part of the Medical and Surgical History of the War, compiled by the Surgeon General. On March 3, 1869, a Joint Resolution of Congress authorized that 5,000 copies be printed at the Government Printing Office. Part I, comprising a Medical and a Surgical Volume, was published in 1870, with a second issue of the Medical Volume in 1875. Part II, vols. 1-2 (medical and sugical volumes), was published in 1876, with a second issue of both in 1879. Part III (surgical volume) was published in 1883, with a second issue in the same year; the medical volume of Part III, concluding the entire work, was published in 1888. The Medical and Surgical History of the Civil War required, therefore, some 26 years for its entire preparation and publication, the printing of the six volumes covering 18 years. Woodward presided over the first two medical volumes (Parts I and II). He died in 1884, having lost his health through "the confinement, anxiety and labor to which he was subjected in his attendance upon the late President Garfield during his last illness (1881-2).

The third medical volume was edited by the late Col. Charles Smart. The first two surgical volumes were edited by Otis and the third surgical volume by Otis and the late Col. David L. Huntington.

We will now consider the separate volumes of the Medical and Surgical History of the Civil War. The work, as stated, consists of six large quarto volumes, of square shape, 9¾" by 11¾", containing about 1,000 pages each. The single-lined columns measure 6 by 9 inches.

The first medical volume consists of a series of statistical tables, summarizing the sickness and mortality of white and colored troops during the years July 1, 1861, to June 30, 1866, as given in the monthly reports made to the Surgeon General, with regard to sickness, death and discharges from service on surgeon's certificate of disability. An appendix of 367 pages (edited by Woodward and Otis) contains the historical reports of medical directors and other medical officers on battles and military operations, arranged in chronological and geographical sequence, so as to make a more or less connected narrative. This appendix, which has since been drawn upon by secular historians, is of the utmost importance, as it indicates the great value of the anticipated reports of division surgeons and other medical officers on the military operations of our present American Expeditionary Force on the western front.

The whole volume is preceded by an introduction by Woodward, showing how the statistics were gathered from the monthly and quarterly reports of medical officers in the field and in military hospitals. The classification of diseases used is that of Dr. William Farr, the most eminent medical statist of England, which was also adopted by the British Army and the Royal College of Surgeons. This classification, devised in 1855, is still used, with some necessary changes, in arranging books in our medical libraries. The only details omitted by the Surgeon General in the Civil War were those "unlikely to be of importance for army use." The statistical tables in Vol. I are arranged in separate groups for the armies operating in the Atlantic, Central and Pacific regions. The system of Regimental, Brigade and Division Hospitals is described and the mode of transition from the old system to the new. The total losses from death had to be obtained, in the last analysis, from the Adjutant General's Office, as being the repository of the military records of the Army, including "the returns of posts, armies, and departments, the monthly muster and pay rolls of individual companies, and the final statements of deceased soldiers."

The files of Killed in Battle or Died of Wounds and Disease had to be completed from the official evidence gathered in relation to pension claims, "on applications made to the Adjutant General by officers of the Pay Department by the Second Auditor, and by the Commissioner of Pensions." The Adjutant General was thus able to furnish a much more complete statement of total deaths from wounds and disaese than the Surgeon General, whose records ceased when enlisted men were invalided or discharged from service. Accurate histories of many thousand wounded or mutilated men for years subsequent to their discharge from service, including the ultimate results of operations or conservative measures, were also obtained via the pension channels, and through the coöperation of the Surgeons General and Adjutants General of the several states, the Examining Surgeons of the Pension Bureau, and many private physicians throughout the country.

The second medical volume treats of the "Alvine Fluxes," *i. e.*, the diarrheal and dysenteric diseases which "usually cause more sickness and mortality among troops during war than any other groups of diseases." The Chapter I, "Diarrhea and Dysentery," is unquestionably the largest chapter ever written on this subject, occupying the entire volume of 869 pages. The subject matter embraces (1) statistical considerations; (2) reports and extracts from medical officers; (3) fatal cases, with accounts of the morbid appearances; (4) pathology and treatment, including achotogy,

connection of diarrhoea with tuberculosis ulceration of the intestines and a survey of every therapeutic device employed, including ipecac (Piso, 1648; Helvetius, 1672; Playfair, 1813; Ségond, 1835; Docker, 1858; Donaldson *et al.*, 1859-61; Woodhull, 1875), now standardized as emetin (Vedder).

Woodward's study of the historical aspects of this group of diseases, with his very careful and elaborate bibliographies in the footnotes, is the most exhaustive ever made. Of the great help given by the Surgeon General's Library in this connection, he says:

"The great Medical Library which my colleague, Surgeon John S. Billings has been enabled, by the library policy of the Surgeon General of the Army and the annual appropriations of Congress, to collect for the benefit of medical officers and of the medical profession of the country, has afforded me opportunities for the study of the ancient and modern literature, and I have endeavored to make the best use I could of the resources at my disposal. I have not, indeed, attempted to present a complete analysis of the literature of the fluxes. Such a work would have occupied several years of study in addition to those already expended, and the practical results could hardly be hoped to repay the time and labor required. But I have endeavored to trace all the more important opinions to their sources, and to weigh the observations by which they are supported.

"In view of the many errors of fact scattered through the text-books, some of which have been repeated for ages by authors copying from each other, I early resolved that, so far as possible, I would cite no authority not before me when I wrote; and that, for the convenience of subsequent students, I would in every case give not only the name of the author, but the edition and page to which each citation referred. In the few instances in which the incompleteness of our growing library has compelled me to depart from this rule, I have explicitly stated the fact and mentioned the actual source of information. Large as the volume has become it would have occupied more than double the number of pages had the literary references and citations been embraced in the text. I have therefore adopted the plan of presenting all such matter, as far as possible, in footnotes where, by using small type, much could be compressed into comparatively little space."

The third medical volume, prepared by Smart (1888), concludes the great work and includes the valuable pathological plates prepared by Woodward before his death. It begins with a chapter "On the Medical Statistics of the War," *i. e.*, an analysis of sickness and mortality among the United States forces, merical statistics of the Confederate armies, prevalence and mortality of disease among the United States troops in Confederate prisons and prevalence and mortality of disease among Confederate troops in United States prisons.

Chapter II deals with the camp fevers; Chapter III with the paroxysmal (malarial) fevers; Chapter IV with the continued fevers (typho-malarial, typhoid, typhus fever); Chapter V with cerebrospinal fever, pneumonic fever, diarrhea and dysentery, scurvy; Chapter VI with the eruptive fevers (smallpox, measles, scarlet fever, erysipelas); Chapter VII with "other miasmatic diseases" (mumps, yellow fever); Chapter VIII with scurvy; Chapter IX with diseases of the air passages (bronchitis, diphtheria, pneumonia, phthisis); rheumatic affections (congestion and inflammation of the spinal membranes, ophthalmia, sunstroke); Chapter X with heart diseases, aneurism, morbid conditions attributed to the weight of the accoutrements, hemoptysis, hernia, lumbar pains, constipation, headache, neuralgia, jaundice,

hepatitis, idiopathic peritonitis, diseases of the kidneys; Chapter XI, with nostalgia, army itch, poisoning, alcoholism and venereal diseases; *Chapter XII with the general hospitals.* This volume contains the first accounts of trench nephritis, irritable heart in soldiers (DaCota), now known as D. A. H., trench jaundice, also a most exhaustive consideration of cerebrospinal meningitis, measles, mumps, pneumonia and typhoid fever in camp, and the first account of systematic prevention of venereal diseases in war-time. The chapter on the General Hospitals shows the transition from the extemporized hospitals set up in churches, theaters in barracks to the standard pavilion type. Lieut. Col. Casey A. Wood has shown that our present base hospitals have been planned directly from the diagrams given in this volume. In the footnotes, no doubt largely prepared by Woodward, there is throughout the volume the same scholarly consideration and analysis of bibliographical sources.

Volume I of the surgical series begins with a most valuable chronological summary of the engagements and battles of the Civil War, giving the Union and Confederate losses in killed, wounded and missing, with sources of information, the whole occupying 120 pages. This is one of the most valuable contributions ever made to the history of military medicine. The rest of the volume deals with injuries of the head, neck and cheek. The treatment is exhaustive, embracing all the important cases accumulated, each case-history being attributed to the operating surgeon who reported it.

The lithographic and chromolithographic illustrations are of extraordinary merit. The historical summaries and footnote bibliographies of Otis reveal the same scholarly accuracy which characterize Woodward's work in the medical volumes. The introduction by Otis constitutes the most fascinating reading in all these volumes. In it Otis gives a careful summary of the administrative machinery which had to be established in order to secure surgical histories from the base and field hospitals, with copies of the blank forms used. He further relates how he secured six quarto volumes of photographs from wounded soldiers visiting the American Medical Museum.

The historical importance of the individual reports of Medical Directors and Inspectors (Tripler, Letterman, McParlin, Brinton, Billings, Voltum, *et al*); the valuable information obtained from Confederate medical officers and from the Confederate hospital registers; the highly commendable management of their medical history of the Confederacy (pp. xx–xxii); a bibliography of the medico-historical literature of other wars; and after a scholarly digression on his methods of work, Otis concludes his introduction with a list of U. S. medical officers (regular and volunteer) killed in battle, died from wounds, and wounded in battle.

Volume II of the surgical series deals in the same thorough-going way with injuries of the abdomen, pelvis, back and upper extremities.

Volume III deals with injuries of the lower extremities, including amputations and ligations; operations of the mouth, air-passages, chest and abdomen, and genito-urinary organs; saber and bayonet wounds, gunshot wounds (statistics and plates); ligations for hemorrhage; tetanus; gangrene; traumatic erysipelas; pyemia; and conservative excisions and amputation.

The volume concludes with three important chapters in anesthetics (giving deaths from chloroform, chloroform and ether, and ether); the duties of the Medical Staff; the surgical matériel and the modes of transporting the wounded (hand litters, wheel litters, mule litters, cacolets, ambulance corps, ambulance wagons, railway and steamboat transportation); summarizing the important features of Letterman's work.

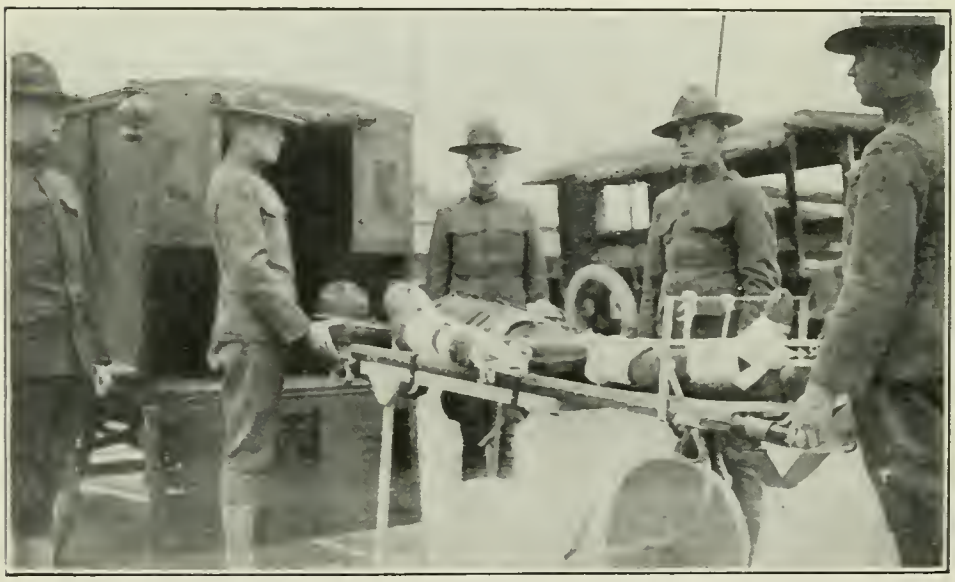
The section of the volume on the effects of missiles and projectiles on nerves (pp. 725–750) is of the utmost historical importance, summarizing Weir Mitchell's well-known work and foreshadowing the brilliant researches of Mario, Harvey, Cushing and others on gunshot injuries of peripheral nerves in the present war. Each surgical volume concludes with an index of reporters and operators, showing that each surgical case was properly credited to its author.

As shown in the interesting "History of the U. S. Army Medical Museum (1862-1917)" prepared from the official records by Dr. D. S. Lamb, pathologist of the museum and recently published in mimeographed form, the Medical and Surgical History of the Civil War was mainly accomplished through the intensive labors of Drs. J. J. Woodward and George A. Otis with the assistance of Contract Surgeons D. S. Lamb, H. C. Yarrow and Corbin on the medical side, and J. Y. Porter, John Stearns, I. C. Rosse and George Rice on the surgical side, with a large clerical personnel.

The work on the pathological specimens in the Museum was done by D. S. Lamb, Fred Adolph, and Ernst, Schafhirt and S. S. Bond. The microscopical work was done by Surgeon Edward Curtis, U. S. A., and Contract Surgeons J. C. W. Kennon, E. M. Schaeffer and Dr. J. C. McConnell. The photographic work was done by Joseph Jouy, Wm. Bell and other hospital stewards. The microscopic photographs were first made by Edward Curtis, afterwards by J. J. Woodward. Among the painters and draftsmen were hospital stewards Edward Stauch, Hermann Faber, William Schultze, H. H. Nichols, E. M. Wells and Baumgras. Brinton says that most of the colored pictures were made by Stauch. The chemical work was done by Contract Surgeon B. F. Craig. The catalogue of surgical specimens in the Museum was prepared by Brig. General Alfred A. Woodhull in 1866, the catalogue of the medical specimens by Edward Curtis. It is plain that the medical and surgical history required the activities of a large military and clerical personnel over a long period of time (1862-1888). By 1881, all the material had been gathered and correlated, the large personnel was dropped, and after the deaths of those giants of industry, Otis (1881) and Woodward (1884), the succeeding editors, Smart and Huntington, had mainly to throw this material into shape for publication and wind up the concluding volumes of the work. No such conditions are possible today. Not only the ordinary limitations of space, time and the human mind, but the complex character of the present undertaking, the time-wasting annoyances and interruptions of modern life and the uncertainty of financial resources, make it a dubious matter to proceed, let alone the plan, along the older lines A medical history of a war of

Splint Drill at Fort McDowell.

(To face page 296.)



Splint Drill at Fort McDowell.

such dimensions as the recent one is the analogue of a huge system of medicine by many authors, as the English have found, and can only be accomplished by concerted coöperative effort.

Casey A. Wood,
F. H. Garrison.

SPLINT DRILL AT FORT McDOWELL[1]

In order to familiarize the detachment of sanitary troops at his depot with the character and application of the seven types of splints that have been found adequate for the treatment at the front of all bone and joint casualties, Col. P. C. Fauntleroy, M. C., U. S. Army, had Hospital Sergeant C. E. Cary make these splints and Dr. J. Molinié's Brouette porte-brancard.

The appliances are as follows: (1) Thomas traction leg splint; (2) Blake-Keller hinged half ring modification of Thomas traction leg splint; (3) Thomas traction arm splint and hinged modification for transport; (4) Jones humerus traction arm splint; (5) long Liston splint with iron bridge interruption; (6) Cabot's posterior wire splint; (7) Jones "crab" wrist splint; (8) Brouette porte-brancard du Dr. J. Molinié.

The figures show a part of the detachment at splint drill.

MISLEADING CLINICAL THERMOMETER CERTIFICATES[2]

Certain abuses by manufacturers and distributors of clinical thermometers are reported in the following letter from the United States Bureau of Standards:

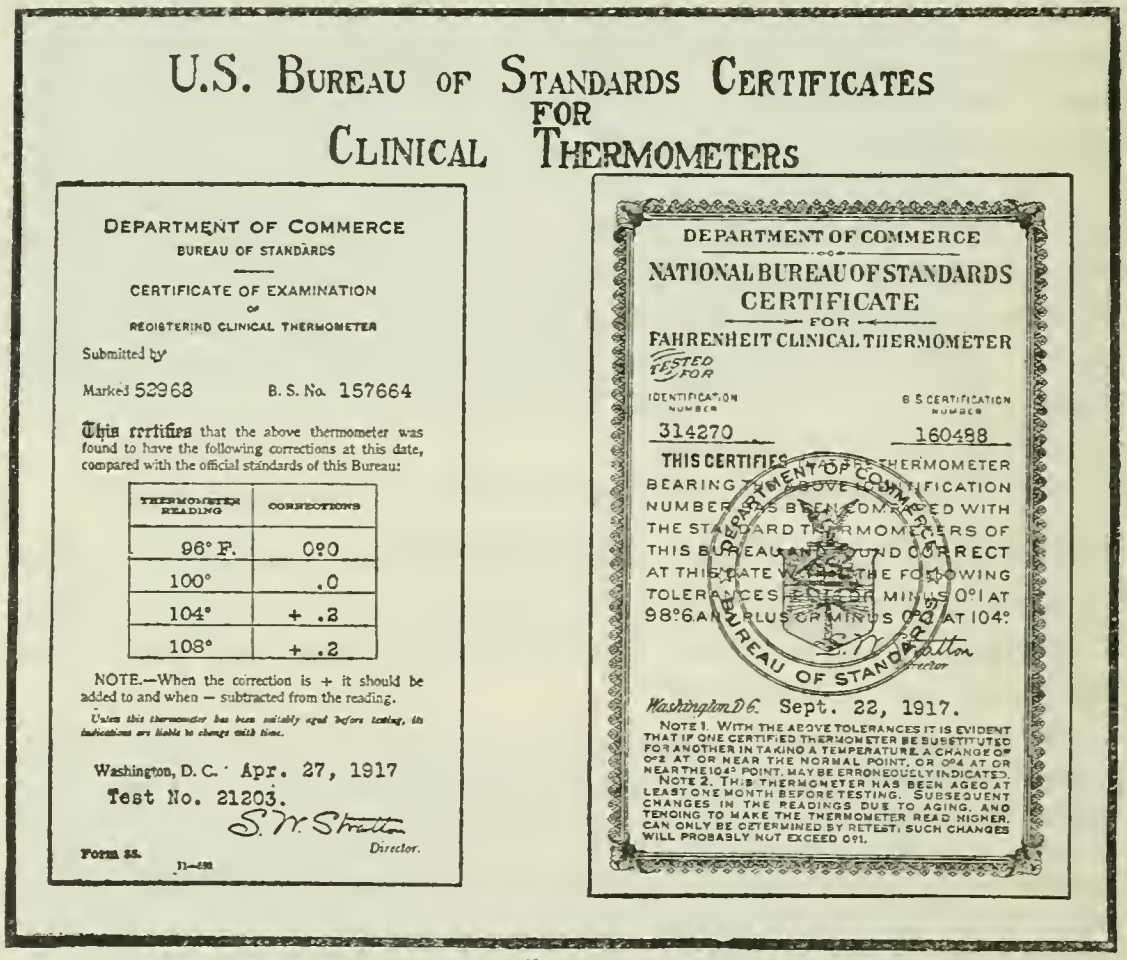
It has been brought to the attention of the Bureau of Standards that clinical thermometers are regularly being sold with certificates of accuracy issued by manufacturers and dealers which, either by direct statement or indirectly by skillful wording, lead the purchaser to believe that the thermometers have been tested or certified by the United States Government. An examination of the enclosed photographs of the certificates indicates very clearly the reason for the misunderstanding. Note the similarity between the older form of government certificate shown in Fig. 1 and the three forms of manufacturers' certificates shown in Fig. 2. The words "National Bureau of Standards" are very prominent on these manufacturers' certificates and the name of the maker is omitted entirely. In fact, nine out of ten persons reading any one of these certificates would fail to note that the complete statement is to the effect that the clinical thermometer has been compared with *our standards*, corrected by the National Bureau of Standards. "Our" refers to the standards of the manufacturers of the instruments and while the validity of the statement is difficult to prove or disprove, since certified clinical standards may have been furnished the manufacturers, the reliability of the thermometer depends solely upon the manufacturer who may or may not have carefully tested the instrument. That many manufacturers do not make such careful tests is indicated by the fact that while practically all of such certificates show correct readings

[1] With four illustrations.
[2] With two illustrations.

at all points, actual tests of the instruments show that only a very small percentage read correctly at all points on the scale.

The Bureau of Standards has not taken the position that the manufacturers should not issue certificates for thermometers, provided the certificates are the result of careful testing, are not deceptively worded and bear the name of the manufacturer. ,

There are reliable manufacturers turning out high-grade instruments who issue their own certificates over their own names. These manufacturers are being done an injustice by their unscrupulous competitors, who without even testing a thermometer boldly state that it has no errors and is sold



U.S. BUREAU OF STANDARDS CERTIFICATES FOR CLINICAL THERMOMETERS

DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS

CERTIFICATE OF EXAMINATION
OF
REGISTERIND CLINICAL THERMOMETER

Submitted by

Marked 52968 B. S. No. 157664

This certifies that the above thermometer was found to have the following corrections at this date, compared with the official standards of this Bureau:

THERMOMETER READING	CORRECTIONS
96° F.	0°0
100°	.0
104°	+ .2
108°	+ .2

NOTE.—When the correction is + it should be added to and when — subtracted from the reading.

Unless this thermometer has been suitably aged before testing, its indications are liable to change with time.

Washington, D. C. Apr. 27, 1917
Test No. 21203.
S. W. Stratton
Director.

Form 25. 11—492

DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
CERTIFICATE
FOR
FAHRENHEIT CLINICAL THERMOMETER
TESTED FOR

IDENTIFICATION NUMBER 314270
B S CERTIFICATION NUMBER 160498

THIS CERTIFIES THERMOMETER BEARING THE ABOVE IDENTIFICATION NUMBER HAS BEEN COMPARED WITH THE STANDARD THERMOMETERS OF THIS BUREAU AND FOUND CORRECT AT THIS DATE WITHIN THE FOLLOWING TOLERANCES: FOR MINUS 0°1 AT 98°6 AND PLUS OR MINUS 0°2 AT 104°.

S. W. Stratton
Director

DEPARTMENT OF COMMERCE BUREAU OF STANDARDS

Washington D.C. Sept. 22, 1917.

NOTE 1. WITH THE ABOVE TOLERANCES IT IS EVIDENT THAT IF ONE CERTIFIED THERMOMETER BE SUBSTITUTED FOR ANOTHER IN TAKING A TEMPERATURE, A CHANGE OF 0°2 AT OR NEAR THE NORMAL POINT, OR 0°4 AT OR NEAR THE 104° POINT, MAY BE ERRONEOUSLY INDICATED.
NOTE 2. THIS THERMOMETER HAS BEEN AGED AT LEAST ONE MONTH BEFORE TESTING. SUBSEQUENT CHANGES IN THE READINGS DUE TO AGING, AND TENDING TO MAKE THE THERMOMETER READ HIGHER, CAN ONLY BE DETERMINED BY RETEST; SUCH CHANGES WILL PROBABLY NOT EXCEED 0°1.

FIG. 1.

in accordance with the requirements of the United States Government. Only recently the bureau was requested to replace or refund the money paid for a clinical thermometer which the purchaser had inferred from the certificate (one of those shown in the photograph) to have been tested and guaranteed by the United States Government. The certificate dated September 22, 1917, shown in Fig. 1, is the form now issued by the National Bureau of Standards unless the other form is specifically requested. The distinctive form should be noted. The seal of the Bureau of Standards appears over the face of the certificate. Up to this time no counterfeits of this new form have been brought to the bureau's attention. The Bureau of Standards has issued a publication (Circular No. 5) on the testing of clinical thermometers which will be sent to anyone sufficiently interested. The publication answers more in detail some of the questions touched upon in this letter, and contains considerable additional information in regard to clinical thermometers. . . .

S. W. STRATTON, *Director.*

Types of Misleading Clinical Thermometer Certificates Issued by Manufacturers and Dealers.

Clinical Certificate

This Certifies

That Clinical Thermometer

No. 7640

has a fixed point, having been subjected to thorough seasoning before scale was engraved, and will not contract or increase its readings above any point called for by the corrections of this certificate as determined by our standard under inspection and certification of the

National Bureau of Standards
Washington, D. C.

THERMOMETER READING	CORRECTIONS
F. 96°	
100°	NONE
104°	
108°	

NOTE: When the corections are + it must be added to the observed reading, and when —, subtracted.

The corrections in the foregoing table are applicable to that Thermometer only which is described by name and number above.

CERTIFICATE OF EXAMINATION

This Certifies that Clinical Thermometer No. 57314 has been compared with our Standards Corrected by National Bureau of Standards and the following readings observed:

Points of Observation on Standard.	Correction.
98°	— 0
100°	— 0
104°	— 0
108°	— 0

NOTE—When the correction is preceded by a + sign it must be added to the Thermometer reading, when — subtracted.

The instrument described above has a fixed zero point, having been Standardized before the scale markings were made and will not increase its readings.

THIS CERTIFIES

That Clinical Thermometer

No. 1768

has been compared with Standard Thermometer

Verified by the U. S. Bureau of Standards, and the following show the correct reading of the scale.

Thermometer Reading	Corrections
95°	−0 0
100°	−0 0
105°	−0 0
110°	−0 0

NOTE—When the correction is + it must be added to the observed reading and when − subtracted.

The corrections in the foregoing table are applicable to that Thermometer only which is described by name and number above.

☞ Please note that the Thermometer as graduated in **Fifths** and the corrections in **Tenths.**

FIG. 2.

CURRENT LITERATURE

Gasödemschutz und-bekämpfung (Gas edema prophylaxis and treatment). Proceedings of the 3d German Surgical Congress, Brussels, February 11 and 12, 1918, in Bruns' Beiträge zur Klin. Chir., 113, 1, 1918, pp. 76–114.

Without wishing to draw merely imaginary parallel lines of comparison between a *disease* the knowledge of the etiology of which may be said to be an accomplished fact and one, regarded as a *complication of war wounds* and the etiological factors of which are multiple and, in part, still imperfectly known, it may, nevertheless, be said that what typhoid fever, in former wars, was to an army in the field and to the *physicians* in the hospitals, the various gas bacilli infections during the present war have been and still are for our armies and *surgeons*, both in the field and in the hospitals, namely: the most dreaded, the most difficult to treat successfully; the very *bête noire* for the physicians and surgeons alike of all the belligerent countries involved in this war. Little wonder, therefore, why gas edema prophylaxis and treatment were made one of the four principal subjects for discussion at the last German surgical congress at Brussels, in which the most experienced scientists and clinicians took an active part. It is, consequently, assumed to be a desirable undertaking to present a brief abstract of this important contribution for the information of our readers:

1. Dr. Rumpel.—Dr. Rumpel proposes to adhere to the use of the collective term "Gasbrand" or "Gasphlegmone" as long as no sharp etiological or clinical lines can be drawn between the different known forms of this infection. He asks: How does it originate? What special conditions favor its appearance on the scene? Are there special wounds the character of which predispose them for the reception of the infectious agents? Are all parts of the body equally liable to become infected? And he believes that much useful information for the prevention of gas infections might be derived could the above questions be answered with precision.

It is now generally accepted as a fact that the infection exists on every battlefield; that infected earth attains access to a wound either directly or indirectly through shell fragments and pieces of clothing, and that trench warfare (Stellungskrieg), owing to the occurrence of frequently repeated actions over the same ground, has enriched the soil and rendered it increasingly infectious and the infecting microbes more virulent and toxic, so as to give the disease, at times, an almost epidemic character.

With reference to a possible predisposing character of the wounds, Rumpel places the greatest emphasis on those caused by fragments from explosive shells, on their depth, the amount of injury done to

deep muscles, the very places where the anaerobes find the conditions most favorable to their growth. The infection is, further, said to be favored through the local interruption of the arterial circulation as shown by a most rapid extension of the process occurring close to such areas; hence, also, the necessity of the earliest possible thorough excision of all the destroyed tissue in the wound (Wundversorgung), its complete drainage as well as the securing for the entire limb a position of rest.

The different stages in the process of the infection—local gas edema, progressive phlegmon, death of the tissues (fertiger Gasbrand) and toxemia—following one upon the other, either rapidly or slowly, either consuming hours or days, between the infection and the appearance of the disease, are the only clinically useful indications for differentiating the mild from the severe forms of the disease that we can rely upon.

On the first appearance of the disease a wide opening of the wound, a splitting of the affected muscles and excision of dead tissues becomes unavoidable. The deeper muscles may already have become involved and show the presence of edema, gas formation and hemolytic discoloration, at a time when the skin betrays as yet no sign of any of these conditions. Following up the track of the shell fragment, through fascia and muscle, the offending piece, most always accompanied by pieces of clothing, is found to be located close to the starting point of the disease. The greater the destruction of the muscles, the less favorable is the prognosis in the case. In the simultaneous presence of serious toxic general symptoms, high amputation, if practicable, may alone save the patient's life.

The after-treatment recommended must consist in rest of the parts and the employment of the open method of wound treatment either with or without the use of antiseptics. Artificial hyperemia (Bier) as a supporting treatment is at times useful in limiting the affected area; against massive toxic infections it is powerless. Hyperemia may also be secured through the application of hot cataplasms, frequently renewed and placed over the parts near the wound. In connection with the production of artificial hyperemia of the parts, as an acknowledged aid in treatment, it strikes the reviewer as strange, to say the least, that blood transfusion, the technique of which has been so greatly perfected within the last few years, is not mentioned!

In view of the frequent failures of merely surgical measures and the uncertainty of their result, experiments with prophylactic and curative serums were undertaken. A "gasödem serum" was injected into patients as soon as possible after their being wounded. Experiments in the field were, to begin with, limited to one division of the army, afterward extended through two divisions. The results of these experiments were not long in showing a numerical decline in the morbidity. From a total morbidity in the entire army of 3 per cent the sick rate

had been reduced to 0.6 per cent. The few cases of "Gasphlegmone" found among the vaccinated were representatives of the most seriously injured, their wounds being, moreover, complicated by the laceration of the main arterial trunk; such patients were almost exsanguinated, partly pulseless and in the agonal stage.

Rumpel noticed, particularly, the entire absence of those cases, frequently met with formerly and in which the disease had proceeded from an apparently simple wound of the soft parts, in which, in other terms, it was not so much the gravity of the injury itself, as it was the picture of a purely infectious disease presenting itself as the prominent feature. Rumpel further noticed a remarkable absence of late cases, that is such as occurred later than 3 days following the injury but which had up to that time accounted for one-third of all the cases. In no case of a subsequently necessary surgical intervention that had to be done nor in any amputation stump did a "gas phlegmon" develop amongst those vaccinated by prophylactic serum injections. These "gasödem" experiments covered a period of over three months and concerned 1,200 wounded. The injections were repeated during the care of the wounded and during later operative interventions. On the slightest suspicion of a patient's sickening, serum was administered intravenously.

While admitting that the situation is not yet ripe for a final evaluation Rumpel believes it has demonstrated that the serum treatment has, so far, reduced the mortality to the extent of 25 per cent.

For therapeutic use Rumpel recommends the giving of large and repeated doses, having himself injected 40–60 c.c. intravenously and intramuscularly at one and the same time; he, moreover, advises that surgeons combine their treatment of gas-infected wounds on the approved principles hitherto in use.

2. Dr. Klose.—Dr. Klose's paper has special reference to the bacterio-serological side of the question under discussion, his particular work consisting in giving the results of investigating the principles upon which the serum treatment of gas bacillus infections must be based. The bacteriological examinations of a large number of gas infections had made it very clear that none but a polyvalent serum could be expected to have any chance of success, taking account of all the bacterial, etiological factors involved and actually found present in the disease. This fact, alone, made, of course, the production of any specific immune serum against gas infections infinitely more complicated and difficult than, for instance, one for diphtheria or tetanus, in each of which the etiology is represented by a well-defined specific microbe.

The collective term, "Gasödembacillen," was made to include all the anaerobes found in and collected from every case of gas infection throughout the war area. The name, also, puts in the forefront the clinical and pathologico-anatomical changes to which the symptoms of

the disease must be attributed. After a most comprehensive series of differentiation-experiments and a final consultation with Pfeiffer, Aschoff, Kolle, von Wassermann and Ficker, three chief groups were established and an additional place was reserved for the so-called K. I.-strain which could be distinguished serologically from the strains of *Bac. putrificus* Bienstock. These three main groups are:

1. Group of the *non-motile butyric acid bacillus;* Welch-Fränkel's Gasbrandbacillus.

2. Group of the *motile butyric bacillus;* Höchster "Rauschbrandbacillus." Aschoff and collaborators' "Vogesenstamm." Pfeiffer-Bessau-Ficker "Oedemstämme."

3. Group of the *motile bacillus putrificus; Bac. putrificus* Bienstock; K. I. "Stämme Klose"; "Watch-dial" bacilli, "Parödembacillen"; Pfeiffer-Bessau.

Klose believes it probable that the above cited grouping is provisional and liable to be simplified and perfected in the near future, since the most recent investigations have enabled investigators to divide the toxin-forming strains in accordance with their toxicologic-serological behavior.

The "gasödem serum" Höchst, employed so far, is for the greatest part, a polyvalent antibacterial immune serum containing but a small and weak quota of antitoxins; the antitoxic power of the serum will be increased in the near future through the addition of the K. I.-strains. From experiments with toxins on laboratory animals, the general conclusion reached was that the toxin-producing power of gas-infection bacilli in cultures remained considerably behind that of tetanus and diphtheria bacilli.

The present intention is to distribute a so-called D-serum which contains, besides the antitoxic bactericidal quota for the strains of the motile butyricus and putrificus groups, an especially effective quota for the Welch-Fränkel gas-infection bacillus and which was obtained by von Wassermann in his immunization experiment with aggressins on horses. It is confidently expected that such a polyvalent, antitoxic bactericidal "gasödem serum" will result in a powerful aid in the hands of skilled surgeons in their efforts to finally control and master the anaerobic wound infections.

The subject was discussed at the congress by von Wassermann, Thies, Pels-Leusden, Heddaeus, Fessler; we will conclude this review with a few remarks made by von Wassermann.

According to him it has been shown that three principal groups of pathogenic bacteria in "gasödem"-infection may be distinguished. The first, or *motile butyricus* group, includes motile, spore-forming, genuine toxin producing bacilli (Ficker) and against the toxin of which an antitoxin is obtainable. The second, or *motile putrificus* group, is likewise characterized by its producing a special toxin (Klose) and

against which an antitoxin has also been obtained. These two toxins are specific: The toxin of the first group is not neutralized by the antitoxin produced by the second group, and vice versa.

The third, or *non-motile butyricus* group, comprises non-motile bacilli in which, however, the production of a genuine toxin has not been found. Against this group a serum may be obtained with the aid of artificial aggressins and which serum protects animals against the infections by these bacteria. This last serum does not protect against or even affect the bacteria of groups 1 and 2, as, vice versa, the sera of groups 1 and 2 have no influence upon the infection caused by group 3. As no other pathogenic bacteria were found, a "gasödem serum" in which the sera of all three of the above-mentioned groups are represented ought to protect against all pathogenic anaerobic gas producers known to us.

As to their respective frequency of occurrence in wounds, it has been found that the members of group 2 appear *least* and those of group 3 most frequently. Von Wassermann recommends the serum for both prophylactic and therapeutic purposes. Prophylactically, he advises its injection into parts about the wound, into tissues as yet sound; therapeutically, in the presence of toxic symptoms, the intravenous and subcutaneous administration of the serum is recommended.

H. G. Beyer.

La Gangrène gazeuse, Bactériologie, Reproduction expérimentale, Sérothérapie, by M. Weinberg et P. Séguin. Masson et Cie, Éditeur, Paris, 1918.

The first two chapters in this excellent memoir are devoted to a general survey of the question of gaseous infections. The very large number of germs described in literature as gas producers and, given different names by their discoverers, had to be passed through a clearing station, properly identified and given new names, in order to bring order out of chaos in nomenclature. The results of this survey form the key to an intelligent understanding of all the following chapters in the book.

To cite but one instance of the manner after which some of the principal organisms of gas gangrene were reduced and renamed, we may quote the following: The bacillus of Wicklein (1891), of Welch and Nuttall (1892), of Eug. Fränkel (1893), having been found identical with that described by Veillon and Zuber (1897) who gave it the name of *B. perfringens,* the last name was adopted in France for all the preceding, apparently, because it conformed to the rules of binominal nomenclature and in spite of the fact that it did not, at the same time, conform to the rules of priority. The absolute necessity, however, of reducing the number of names and of a more precise characterization and definition of those into which they were drawn for all future

descriptive purposes, must be admitted. It was a very laborious but also a most creditable undertaking.

Observations very soon proved conclusively that the pathogenesis of gas gangrene was so complex that even bacteriologists found themselves unable to put any precise limits to its complexity. It was found that gas gangrene was caused by a great variety of organisms, some of which played a more dominant rôle than did others, necessitating their further classification into principal and accessory germs, leaving a few, the rôle of which is still undetermined.

The authors consider that the following named anaerobic germs produce gaseous infections: *B. perfringens, B. edematiens, Vib. septique, B. fallax, B. aerofoetidus, B. sporogenes* and, possibly, two aerobes: *B. coli* and *B. proteus;* that a gaseous infection is more often the result of a combination of principal and accessory germs, presenting the following characteristics. There are:

1. Cases in which the emphysematous condition prevails over the edematous lesion; such cases are produced by virulent germs that are great gas producers; these give rise to what the authors term the *classical emphysematous forms.*

2. Cases in which the edemata prevail and gaseous infiltrations are slight or even absent; they are caused by the toxic anaerobes and, therefore designated as *toxic or edematous forms.*

3. Cases in which the edemata prevail and gaseous infiltrations are the result of an association of toxic and virulent bacilli; they are spoken of as belonging to the *mixed form* of gas gangrene.

The cases of the first group may be produced by, either the *B. perfringens, Vib. septique* or by an association between *B. perfringens* and *Vib. septique* or one between *B. perfringens* and *B. edematiens,* etc.

In the cases ranged under the second group the organisms found were: *B. edematiens, B. perfringens* or diverse associations of *B. edematiens* with *B. perfringens,* or *B. edematiens* with *Vib. septique* and *B. fallax,* etc.

In the cases of the mixed forms several of the anaerobes were always found associated, namely: *B. edematiens* and *B. perfringens; B. edematiens* and *B. fallax,* etc. Putridity, accompanying these various forms, could always be attributed, principally, to the presence of *B. sporogenes.*

Gas gangrene is not a morbid entity with a specific pathogenesis but a syndrome.

In the fourth chapter of the book the authors publish the results (1) of their personal studies of the anaerobes which they had isolated; (2) of those isolated by others, and (3) of those formerly incriminated but not found in the flora present in war wounds.

The anaerobes personally investigated by the authors are the fol-

lowing: *B. perfringens*, Veillon et Zuber; *Vibrion septique*, Pasteur; *B. sporogenes*, Metchnikoff; *B. putrificus*, Bienstock; *B. tertius*, H. Heury; *B. bifermentans*, Tissier et Martelly; *B. œdematiens*, W. et S.; *B. fallax*, W. et S.; *B. aerofœtidus*, W. et S.; *B. histolyticus*, W. et S.

In all these microbes the morphology, cultural characters, biochemical properties, pathogenic power, specific antibodies, identification and systematic position were investigated according to the most recent methods and described in great detail; their morphological characters illustrated with desirable clearness. These laboratory studies have furnished the most important documentary evidence upon which the authors base their position in relation to the subject of gas gangrene; they cover 150 pages in the book.

In chapter vi we are furnished with abundant bacteriological proof of the now well-established fact that the pathogenesis of gaseous infections is extremely varied; in their studies of the anaerobic flora of cases investigated not less than 40 different types have been met with by the authors; in the cases of gaseous infections in which several anaerobes are found associated the intoxication of the patient is the resultant effect of all their toxins combined; this condition is termed by the authors: *"cenotoxic."* and the associated toxins: *"cenotoxines."*

Chapter vii gives us the descriptions of the different clinical forms of gaseous gangrene and their experimental reproduction, one of the most readable and practically important chapters in the book, as is also chapter viii, on etiology.

With what the authors have to say of "serotherapy" we must limit ourselves by quoting the remarks made by them on page 326.

"By reason of the varied pathogenesis of gas infections, it seemed to us preferable, in treating infected war wounds of slow development, to make use of an "autovaccin" prepared with all the different germs found present in the pathological sera and disintoxicated by iodine. We have advocated the employment of iodized autovaccines and of iodized pyovaccines."

We may conclude this brief review by giving the technique for the preparation of the "pyovaccine" as described in the book.

"A small quantity of serous fluid taken from the wound is placed in contact with Lugol's solution, diluted one-third, in the proportion of one-fifth of the iodine solution to four-fifths of the purulent serum. At the end of two to five minutes the mixture is centrifuged. The clot is taken up by a few cubic centimeters of physiological salt solution, and the vaccine, thus obtained, is injected, at doses varying from one-fourth to one-half c.c., under the skin of the wounded. The treatment is continued with the microbes, isolated from the wound of the patient, and disintoxicated by iodine in the same manner . . . it is a simplified technique; the serous fluid, after contact with the Lugol's solution,

being immediately injected into the patient without centrifugation and previous lavage."

Autovaccines are prepared after the same fashion, starting with cultures.

H. G. Beyer.

L'épreuve de la concentration et l'épreuve de l'eau moyen le plus simple dans le diagnostic de la nephrite de guerre (The concentration test and the water test as the simplest means in the diagnosis of war nephritis), by G. Mendès. Abstracted from "*Il Policlinico*," March, 1918, in: *Office internat. d'Hygiène publique*, t. x. No. 6, June, 1918, p. 708.

War nephritis, according to Grote, is, anatomically considered, an acute diffuse, but benign, glomerulo-nephritis. The patient, after having passed the acute stage, recovers almost always under an appropriate treatment

In consideration of the large number of cases of war nephritis, it would, naturally, be best to collect them all in special hospitals provided with the means for research work. But, the author holds, even without such conveniences, it is possible to watch the condition of the kidney from day to day and to build up, on the results obtained, an appropriate course of treatment, and of which the dietary regimen is *the most important part,* with the means at hand in every hospital or field ambulance. Even if, under prevailing conditions, it is found impossible to make accurate quantitative determinations of urea and NaCl eliminated through the kidneys or retained in the blood, the changes occurring in the kidneys may easily be determined approximately.

The end-products of metabolism pass through the kidneys with the urine, in direct and quantitative proportions to the functional capacity of the organs of elimination, the kidneys. The inherent tendency of the kidneys is to eliminate these metabolic end-products in a definite state of concentration, depending to a certain extent on the available quantity of water present, as shown by the specific gravity. At the same time the elimination of the watery constituent of the urine must not be neglected.

I. For the purpose of making the *first test,* that of concentration, the patient is given the ordinary diet, deprived of fluids, except those indispensable for culinary uses. The products of metabolism remaining the same, a normal kidney will react by secreting a more concentrated urine, shown in an increased specific gravity, up to 1,030 or more. Now, if the specific gravity of the patient's urine remains unchanged, or very nearly so, the function of the kidney must be assumed as being impaired.

II. For making *the second or water test,* our patient is given, in the morning, on an empty stomach, 1,500 c.c. of water. During the next four hours and every half hour, the quantities of urine eliminated are

measured, while the patient remains in bed, receiving no food. In this way certain very characteristic curves are obtained, indicative of the nature of the changes undergone by the kidneys.

The diet to be established is based on the observed results: If the concentration test resulted in giving a urine of the specific gravity of 1,025 or over, then a normal diet is called for. The author decidedly condemns a subliminal diet under such a showing, especially large quantities of milk.

The quantity of liquids allowed the patient must in every case be made dependent on the results obtained in the water test. In cases of serious deficiencies in water elimination, an almost dry diet (less than one liter of fluids) is indicated and additions made only in proportion to the observed improvement in the state of the patient.

The above described tests are counterindicated in cases of edemas, either on the way of disappearing or in process of formation, also when uremic complications are threatening.

H. G. Beyer.

Utilité d'une bonne ventilation permanente dans un service de contagieux (The benefits of a permanent and efficient ventilation in a contagious fever hospital), by Jules Renault. (Abstracted from *Bull. de l'Acad. de Med.*, t. lxxix, No. 19, 14 Mai, 1918, p. 368.) *Office internat. d'Hygiène publique*, t. x, No. 7, Juillet, 1918, p. 841.

Experienced pedagogues have long since realized the truth of that old adage: *"repetitio mater studiorum est;"* that, even the most elementary lessons, in order to become permanently fixed in the minds of their pupils, must be driven home by repeated efforts, from all possible angles. The principle proves true not only for the young and rising generations but, equally, for those already more experienced students in the practical application of such lessons.

With regard to ventilation we are all aware of the fact that we breathe into the same reservoir from which we derive the air for inspiration, the main object of ventilation being merely a process of dilution. The test of an efficient ventilation, no matter by what system, is therefore the relative freedom of the air from substances not contained in normal air, whether these consist in chemical substances or more or less solid particles.

Jules Renault, having found the ventilation deficient in one of the contagious pavilions for infants under his service at the "Hôpital Saint Louis," and, after some vain attempts to improve it, finally succeeded in obtaining a system for a permanent ventilation without propulsion (natural ventilation due to temperature differences between outside and inside.—Rev.) from the "Administration de l'Assistance publique," and which, the author states, has given him "entire satisfaction."

Under this installation the air is conducted into the chambers of

the pavilion by two apparatuses, one placed on the right, the other on the left side of the pavilion. The outside air, taken in at the basement, is led through large pipes into a voluminous caisson in which it is filtered through loose wadding which is renewed at the beginning and middle of the winter. From this caisson two large pipes conduct the filtered air into the upper floors of the pavilion, where, through some smaller pipes, it finds its way into the chambers in which it is allowed to escape behind the radiators—one for each radiator. The viciated air leaves the chambers through venetian blinds, placed in the mouldings at the tops of the windows. The dimensions of the different parts in the system are so calculated that the air within the chambers is renewed once in one and a half hours, it having been ascertained that less would not be sufficient and more give rise to disagreeable draughts. The author states that, on coming from without into these chambers, a most agreeable freshness in the air is noticed even in the winter when the thermometer registers 20° C.

The practical results are shown in the adjoining table:

	Year	Admissions	Deaths	Mortality
				Per cent
19 *Scarlatina:*				
Before ventilation.....	1911	53	4	7.5
	1912	66	5	7.5
	1913	64	5	7.8
Since ventilation.....	1914	40	1	2.8
	1915	68	0	0.0
	1916	68	2	2.8
29 *Measles:*				
Before ventilation.....	1911	149	22	14.7
	1912	164	19	11.0
	1913	175	19	10.8
After ventilation.....	1914	122	6	4.9
	1915	176	14	8.0
	1916	105	5	5.7

H. G. Beyer.

Expériences sur la valeur désinfectante de l'air chaud fortement agité (Experiments on the disinfectant power of hot air in rapid motion). Abstracted from *L'Igiene Moderna*, February, 1918, in: *Office internat. d'Hygiène publique*, t. x, No. 6, June, 1918, p. 716, by H. Rautmann.

Recognizing the objections inherent in steam disinfection, the author has constructed an apparatus, a sort of closed chamber, in which hot air could be made to circulate with great rapidity by means of an electric motor, throughout the enclosed space. The volume of circulating air remaining constant, the amount of heat necessary for maintaining its temperature is reduced to a minimum of expense. Thus the author

found the temperature, at different points of the interior of the chamber, and after half an hour's operation varied but 3°, showing 155° C. at one point and 158° C. at another.

Lice, obtained from swine, were destroyed in one-quarter to one minute; spores of anthrax, typhoid germs on pieces of flannel and other objects of different kinds were completely destroyed, while leaving the fabrics, including leather, uninjured.

It is more especially the animal parasites that are most easily destroyed—within a few minutes. The vegetative forms of bacteria are killed as soon as the temperature reaches 100° C., and, since most of the pathogenic germs have no spores, we can obtain at this temperature the disinfection of objects infected with the germs of typhoid, cholera, plague, influenza, diphtheria, tuberculosis, glanders, swine plague, chicken cholera and germs of suppuration. For the destruction of spores the temerature of the air must be raised.

The author concludes that heated air in rapid motion is an efficient and practicable means of disinfection; he sees, especially in louse destruction, where this new method realizes a certain economy both with regard to installation and to running expenses. The older apparatuses employed in the destruction of lice may be transformed into hot-air chambers.

H. G. Beyer.

Le Paludisme à Bord de "la Marseillaise" sur la Côte occidentale de l'Afrique (Malaria on board the *La Marseillaise* on the west coast of Africa), by Dr. G. Goelt, médecin de 1re classe de la marine. *Arch de Méd. et Pharmacie Navales*, No. 2, August, 1918, p. 118.

The very interesting, instructive and, in many respects, dramatic story of the author of the ravages made by malaria on board the *Marseillaise* is so typical of the havoc this disease can create on board a cruiser that the reviewer considers himself justified in presenting it to the readers of The Military Surgeon in the author's own words as nearly as this can be done:

"*La Marseillaise*, coming from Brazil, arrived at Dakar on September 23, 1917. The sanitary conditions on board were excellent; the ship was ordered to go into drydock for some repairs to her bottom, and then to continue on her voyage to Agadir.

"It was the season during which the colony was the most insalubrious, and we learned on our arrival that there was a great deal of malaria on shore and that the first cases of blackwater fever had already made their appearance. Everybody on board was immediately put on preventive doses of quinine.

"Between September 23 to 28 we were at anchor in the roadstead, and saw but few mosquitoes. But, soon after having gotten into dock, September 28, the ship was invaded by anophelines. In one single

night the ship was filled with them, and this for two cogent reasons: in the first place, the dock was extremely dirty, and even during normal times a veritable nest for mosquitoes; and, in the second place, the wind blew from the direction of a swampy plain, known to be full of fever and mosquitoes. Sufficient protection by mosquito netting or the closing of all the open places by wire screens not being available, we resorted to the use of an ointment consisting of equal parts of camphor and salol and with which we anointed the bodies of the men, with the view of keeping off the mosquitoes and of relieving the pain from their bites. On October 4 (six days since getting into dock) we left Dakar, having on board but four cases of malaria, but a steady increase in the number of cases could be noted from day to day, and on the 7th, when we arrived at Port-Étienne, we had 125 cases in beds; we parted on the 8th with 145 sick. On the 11th we had a maximum of 289 cases of syncope occurring in men who were on their way from ham- from ten to twelve days.

"The recurrent seizures were all alike, sudden, with violent headaches, intense lumbar pains and stiffness, face red and swollen, eyes brilliant, temperature rising without chilly rigors, no bilious vomiting in the beginning.

"Many of the recurring seizures became bilious, with nausea and vomiting, whenever the temperature began to rise. The attacks continued for six to eight days, some lasting for twelve days. There were cases of syncope occurring in men who were on their way from hammock to closet; some were delirious for several hours, the delirium disappearing with the fever, leaving but a light mental confusion. On the 18th day of October, the day of our arrival at Agadir, we still had 144 sick in bed, but the daily admissions decreased, and with the decrease in atmospheric temperature the number of mosquitoes declined.

"On October 27, the day of our return to Dakar, we had but few new cases a day, while the relapses became numerous and occurred without showing any regularity as to time; all, without exception, were tertians.

"The attacks occurred always during the morning, the patients reporting at the sick-bay after the 11 o'clock meal with violent chilly rigors, the temperature rising. The fever lasted from six to eight hours and terminated in an intense perspiration. Quinine had a more marked action in these tertian forms than in the preceding remittent cases; they were made to disappear after the third day.

"Out of a complement of 598 men, 440 were attacked; 307 suffered a second tertian invasion, furnishing 532 relapses. Out of these 307 tertian cases 154 had one relapse, 101 had two, 32 had three, 20 had four.

"*Observed complications.*—On our arrival at Agadir, one of the mechanics had an attack of Raynaud's disease (local asphyxia of the extremities of the blue form). This was followed by gangrene of the toes and even of the feet, where blackish sloughs began to form; he

was sent to the hospital at Casablanca. One of the sharpshooters, after at attack of remittent fever, presented a keratitis, followed by an ulcer of the cornea. Edemata were observed frequently. One case even showed general anasarca, heart and kidneys being absolutely normal. Aside from this case, the edemata were partial, attacking the malleoli and the scrotum, painless, white, causing but slight formications during their being absorbed. Amnesias and deliria, followed by mental confusion and disappearing with defervescence, were observed.

"One breveted sharpshooter, for the period of a week, was the victim of a dreamy delirium, seeking to find one of his relatives in every part of the ship and to wash his garments. A second master gunner was temporarily delirious, jabbering unintelligible phrases, afterwards remembering nothing that had occurred during the period. Another master gunner, with neurasthenic tendencies, panphobic and suspicious, suffering from insomnia, lived a life of sadness and solitude, speaking to no one, answering hardly any questions, except complaining of severe 'migraines.' Several cases of an urticaria-like eruption, during the febrile period, were observed.

"A steward presented a beautiful case of intermittent torticollis that lasted several days. Convalescents complained of diverse forms of neuralgia: intercostal, lumbar, scapular, crural, etc., all of which disappeared on a few grams of quinine. Tremors, "à grandes oscillations," increasing during intentional movements and persisting for a long time, were observed; one of the quartermasters had them even during his sleep for more than a month.

"*Pernicious attacks.*—Three of these were very striking. On our arrival at Agadir, 'second-maitre' I., for three days down with bilious remittent and showing nothing but slight agitation, so that he could scarcely be kept in his hammock, his temperature going down on the fourth day, when, suddenly, during the evening, he had an algid attack; the pulse became small and intermittent, extremities grew cold; dark circles appeared around the eyes. In a few hours, in spite of injections of ether-quinine, his head, shoulders and arms were covered with cold perspiration, while other parts of the body remained hot. Temperature 37°. He did not feel cold. His temperature went down to an alarming degree, his features became drawn more and more, his eyes retreated and his lips became cyanosed, while he remained perfectly conscious and answered all the questions. He died at the very moment when the temperature went up to 40° C.

"On our arrival at Fort-de-France, quartermaster D., after coaling all day the previous day, was taken suddenly, at morning quarters, with a pernicious epileptic seizure. After a series of slight crises, frequent to overlapping, these crises terminated in a furious delirium; he remained delirious all day at the hospital into which he was transferred, developing new crises, necessitating the straitjacket; he saw himself

pursued by his comrades wanting to strike or kill him; gradually recovering, regaining consciousness without the slightest recollection of what had occurred. Prodromata, in the form of 'migraines' and tremors, had been noted by his comrades, he having become vindictive and irritable.

"Another case of the delirious form, presenting similar symptoms as the preceding, occurred in the person of 'matelot timonnier' Le G.

"Finally, choleric and dysenteric forms occurred, the stools being frequent and sanguinolent, or simply serous and copious.

"There were on board the *Marseillaise* a certain number of parrots, parochites, a striped monkey and a baboon. Many of these died on our trips between Dakar, Agadir and Fort-de-France, without the cause of death having been determined; but the striped monkey and the baboon, having presented chills, followed by somnolence and bilious vomiting, may be assumed to have died from malaria."

Such is the pathetic story of malaria on the *Marseillaise,* which will surely interest those of all our naval colleagues who, like the reviewer, could tell similar, if not identical, tales from experience.

H. G. Beyer.

BOOK REVIEWS

Symptoms and Their Interpretation, by James MacKenzie, M.D., LL.D. (Aber. and Edin.). Third edition, 318 pp. $3.75. New York: Paul B. Hoeber.

This work deals largely with the reflex phenomena of disease and the valuable aid to diagnosis afforded by the careful study of pain and the nervous phenomena which accompany it. Special emphasis is given to visceral pain and its proper interpretation, suggesting a great field of research for the surgeon. The writer directs attention to the opportunities offered the general practitioner to recognize the early signs of disease and thus add valuable contributions to medical knowledge. An appendix is added on clinical investigation in which the writer expresses as his view that medical research had better be delayed until the investigator has realized exactly where knowledge is deficient from personal experience, and not leave it entirely to the young man, although otherwise well prepared. The monograph is written in the usual fascinating style of this keen observer and presents a familiar subject in a most attractive and stimulating manner.

Walter L. Bierring.

The Action of Muscles, Including Muscle Rest and Muscle Education, by William Colin Mackenzie, M.D., F.R.C.S., F.R.S. (Edin.). 267 pp., $3.00. New York: Paul B. Hoeber.

This is a most timely publication, especially as the interests of military surgeons will soon be largely taken up with reconstructive measures. The view is commonly held that, of the wounded men returning from the battlefields in the world's war, some 65 per cent are suffering from disabilities of an orthopedic nature; in other words, whether the injury be one of muscle, bone, joint, nerve, or central nervous system, it is of a character in which the question of muscular function becomes of prime importance for purposes of treatment.

The principles of muscular action and muscle reëducation are considered extensively, followed by a series of chapters on localized disturbances in muscle areas, with a discussion of anatomical considerations of joint fixation and a special chapter on the muscles of respiration. The work is profusely illustrated, which adds greatly to its value as a guide in the treatment of the special orthopedic conditions with which it is concerned.

Walter L. Bierring.

Clinical Disorders of the Heart Beat, by Thomas Lewis, M.D., D.Sc., F.R.C.P. Fourth edition, 120 pp., $2.25. New York: Paul B. Hoeber.

In this monograph cardiac disorders are considered under seven headings: (1) sinus arrhythmia; (2) heart-block; (3) premature contractions or extra-systoles; (4) simple paroxysmal tachycardia; (5) auricular flutter; (6) auricular fibrillation; (7) alternation of the heart. The purpose of the writer is to present in simple terms the manner in which these several conditions can be recognized by such means as the general practitioner has at hand to study the changes in the heart beat. In each form of cardiac irregularity the relation to more exact graphic methods is considered, but

it is clearly shown that they are not essential for diagnosis. The etiological and pathological relations, as well as a brief discussion of the prognosis and treatment of each type of disorder, are distinct features of this work. Like its previous editions, it constitutes a valuable addition to the knowledge of cardiac disorders.

WALTER L. BIERRING.

SURGERY OF THE SPINE AND SPINAL CORD, by Charles H. Frazier, M.D., Sc.D., with the collaboration of Alfred Reginald Allen, M.D. With six colored plates, two charts and 315 illustrations in the text; 971 pp. New York and London: D. Appleton & Company, 1918.

This is the most exhaustive treatise upon the subject that has as yet appeared. The author, in his preface, says: "It has been my purpose to deal with the subject so comprehensively that it will not be necessary for the reader to consult collateral works. Thus there has been included in the contents chapters on the Anatomy of the Spine and Spinal Cord, on the Cerebrospinal Fluid and its Relations to Spinal Diseases, and on the Roentgen Examinations of the Spin. These chapters, each written by a well-known authority, are so replete with information and so essential for reference that they constitute an extremely valuable feature of the monograph."

Dr. Piersol contributes the chapters upon the Anatomy of the Spine and Spinal Cord in quite as comprehensive an article, and more attractively written than is the same subject in his "Human Anatomy." Dr. Reginald Allen—the same Major Allen, as an officer of the line, who only a few weeks ago gave up his life, killed in action in France—writes the chapter upon the Normal and Pathological Physiology of the Spinal Cord, and Dr. John A. Kolmer that on the Cerebrospinal Fluid and its Relation to Spinal Diseases. Both of these chapters are really valuable monographs which may be consulted by specialists in neurology and sero-bacteriology, with confidence. That these subjects have a place in a work of this type is evidence of the relationship they bear to an advanced science in medicine. Few surgeons, except those gifted with a recognition of the limitation of their own comprehension, are safely enough educated to fully understand and personally apply the knowledge of these chapters. The neurological surgeon should be such a man. The general surgeon must recognize, in surgery of the spine and spinal cord, the necessity of calling to his assistance men skilled in neurology and sero-bacteriology. He should sum up the evidence of their findings together with that of his own clinical knowledge, and in this way arrive at a diagnosis and index for treatment. The chapters of Allen and Kolmer will certainly be of great assistance to the general surgeon in checking up the sum-total of the studies on a particular patient, so that the indication or contraindication for surgery may be scientifically carried out.

It is a most difficult thing to correctly interpret X-ray examinations of the spine, and Dr. Pancoast, who writes the chapter upon the Roentgen Examinations of the Spine, makes special emphasis of the fact that so far by this means no direct knowledge has been obtained in diseases and injuries of the cord or its membranes, and it is not likely that success in this direction will ever be achieved. However, in pointing out the difficulties and uncertainties of Roentgen examination, he teaches both by text and

roentgenograms how injuries and diseases of the spine may be best recognized and mistakes avoided. This chapter is worthy of close study, more particularly as it will aid the surgeon to better comprehend the conditions in an individual case, and he may discuss the X-ray findings of the specialist with a better balance than when alone depending upon the roentgenologist's opinion.

The part of the book that bears the personal stamp of the surgeon author begins in Chapter V, Spina Bifida. It is one of the most logical and complete articles upon the subject that has been written. The author emphasizes the grave character of this congenital defect; that, considering all types, from 80 to 90 per cent die during the first year, and that of the small percentage remaining, "the majority are mentally defective or physically crippled." Working upon this hypothesis Dr. Frazier carefully indicates what may be expected of surgery, its uselessness in certain types, its hopelessness in others. He holds that with the exception of otherwise suitable cases in which there is threatened rupture of the sac, "operation should be deferred until after the first year and even then resorted to only in a carefully selected group." The contraindications to operation given are hydrocephalus, irreparable deformities, paralysis of the sphincters and complete paraplegia. In substance it is still considered that operation lessens the chance of meningitis, has an esthetic side in removing an unsightly deformity, and rarely prevents or relieves paralysis.

Attention is called to the practically obsolete treatment by injection, —the report of the Committee of the Clinical Society of London is tabulated, and the conclusion arrived at by the committee that "the treatment by injection is the best with which we are acquainted, and the only one which we feel justified in recommending." The other methods of treatment referred to are by puncture, by ligation, and by excision. Dr. Frazier considers this report instructive and valuable. It would seem to the reviewer that if great care were exercised in the technique such as is now known as necessary to safely localize the injected fluid in spinal anesthesia, a rejuvenation of the injection method may again have a place in the treatment of spina bifida.

There is nothing of special importance to note in the technique of operations recommended; the author describes and illustrates one of his own as well as that of Babcock. This chapter is valuable in that, from a practical standpoint, safe and sane counsel will be found; it will check the overly ambitious operator; it will assist the safe man.

In a most thorough manner 173 pages are devoted to two chapters: one on Trauma, which includes Sprains of the Spine, Contusions of the Vertebrae, Dislocations of the Vertebrae, Isolated Fractures, Fracture Dislocations, Concussions of the Spine, Contusion of the Spinal Cord, the Symptomalogy and Differential Diagnosis of Cord Lesions. The other chapter is devoted to Stab and Gunshot Wounds. In both of these chapters will be found summed up the general experience of the profession, brought up to date.

There is a most interesting chapter on Spinal Tumors. Frazier reminds us that it is only twenty-five years since Sir Victor Horsley performed the first operation for "the removal of a spinal tumor," a condition which, up to that time, had been considered hopeless. It is well known that this case stimulated study and led to increasing interest upon the part of neurologists

and surgeons, in attempts at localizing and removing spinal tumors. So many have now been studied that classification of tumors according to the location has been possible, and Frazier shows in a table such a classification, based upon 330 cases. Other tables are shown in the study of these 330 cases—how the tumors are distributed according to sex and age. These facts are mentioned simply to show how careful and complete have been the efforts to systematize the premises from which deductions of symptomatology, treatment and prognosis are based.

Frazier tabulates 97 intradural and 55 extradural tumors and says that he can now differentiate with a fair degree of certainty between the extramedullary and intramedullary growths before operation. But he says it is often difficult to distinguish between extradural and intradural tumors, *i. e.*, the extramedullary tumors. He discusses this subject in a brief but very interesting way: the Symptomatology, Topographical Diagnosis, Treatment and Prognosis of Spinal Tumors is most accurately and painstakingly given, and particularly is the prognosis to be mentioned as it is based upon the location of the tumors, their origin, their pathological diagnosis, upon age and sex. He finishes with a table of final results in cases surviving operation for spinal tumor. Altogether this is a most valuable chapter on the subject of Spinal Tumors, which can be consulted by the general surgeon.

There are chapters on Meningitis, in which pachymeningitis, leptomeningitis, and syphilitic meningitis are included.

Chapter X, Surgery of the Spinal Roots, is one of the most interesting and instructive in the book and should be of great value to orthopedic surgeons, as the author has so thoroughly sought out the sources of knowledge of this difficult subject. Reference by the reviewer to the latest American works upon orthopedic surgery indicates that their authors tend to sidetrack operations upon the spinal roots as unnecessary or inadvisable in the correction of deformities having a central origin (Little's disease). Very recent papers and discussions indicate, however, a change of opinion among the active progressive workers in this specialty. One Ohio clinic reports a series of twenty-two cases of Little's disease, in which Förster's operation was done as a part of the treatment, with two deaths—a mortality of 9 per cent. Frazier was only able to collect seventy cases of Little's disease in which a rhizotomy had been performed, since Förster's proposal in 1908, with a mortality of 12.8 per cent.

As an example, the general surgeon likewise will learn from this chapter the indications and technique of division of the posterior nerve roots (rhizotomy) for intractable pain, the relief of gastric and intestinal crises of tabes, and the speculative intradural anastomosis for the relief of paralyses.

The peripheral substitutes for root section are described, that of Stoffel, the section of those bundles of nerves in a nerve trunk, isolated by faradic stimulation, which supply the groups of spastic muscles; Schwab and Allison's alcoholic injections of the nerves supplying the spastic muscles, and Spitzy's methods of transplanting certain nerves with the idea of bringing about a better muscle balance.

The remainder of the book is descriptive and illustrative of operative technique. Lumbar puncture, its technique and application, is thoroughly described. A chapter upon Intraspinal Therapy is a very timely and

important one, treating of the intraspinal injection of Flexner's Serum in Meningitis, the Anti-Tetanic serum in Tetanus, and of the intraspinal treatment of Syphilis of the Nervous System.

The final chapters are on Intradural Anesthesia and Extradural Conduction Anesthesia, Laminectomy and Chordotomy. Of the chapter on Laminectomy it can be said without contradiction that it is the best that has yet appeared. Nothing seems to have been left out that tells how to do the operation in the best interests of the patient.

Too great praise cannot be said of the illustrations profusely used throughout the book.

Each chapter is followed by an exhaustive bibliography. This book, written by a master of its subject with a collaborator of the same type, stands without question the best of its rare kind. It is encyclopedic—a book for very deliberate study; not so readable, perhaps, as one or two others upon neurological surgery where conviction in the author's point of view is rapidly absorbed. Throughout the whole work the painstaking reasoning and deductions of Dr. Frazier appeal to one's common-sense. William Hazlett, in one of his "Table Talks," says, "Common-sense is an impartial, instinctive result of truth and nature, and will therefore bear the test and bide the scrutiny of the most severe and patient reasoning. It is indeed incomplete without it."

JNO. E. SUMMERS.

A GUIDE TO THE ORGANIC DRUGS OF THE U. S. P., 1910. Compiled and arranged by John S. Wright. Revisions and additions by Francis A. Federer and Harry W. Tull. Third revision, with appendix. 70th thousand. Prepared for students of pharmacy. Published from the botanical department of Eli Lilly & Company, Indianapolis. Issued in vest pocket edition with leather binding. Price 25 cents.

This little guide gives, in addition to the organic drugs of ninth revision of the United States Pharmacopoeia, those of the third revision of the National Formulary and a few of the more commonly used non-officinal drugs. It contains, in addition to the brief accounts or organic drugs, a conspectus of the families of the plants mentioned, a glossary of the botanical and therapeutical terms used and an index of botanical synonyms. The third revision will continue to serve satisfactorily the purpose for which the guide was originally intended, that of a vest pocket aid memoire for students of pharmacy.

FRANCIS M. MUNSON.

THE AMERICAN HOSPITAL OF THE TWENTIETH CENTURY. A treatise on the development of medical institutions, both in Europe and America, since the beginning of the present century. By Edward F. Stevens, Architect. Member of American Institute of Architects, Member of Province of Quebec Association of Architects, Member of American Hospital Association. Illustrated. New York: Architectural Record Publishing Company, 1918.

This beautifully illustrated book places at our disposal much valuable information heretofore difficult to secure in condensed form, as recent books

on American hospitals are very few in number, and none, except this one, are commensurate with the rapid growth and development of the modern American hospital. The writer has collected and presented in a pleasing manner plans and information concerning a few of the many good institutions recently finished or under construction. He does not criticise the plans of the institutions, but presents them as various solutions of the great problems of housing and caring for the sick and points out a few of the findings of his own experience in the planning of many hospitals and institutions.

FRANCIS M. MUNSON.

ENGLISH, FRENCH, ITALIAN MEDICAL VOCABULARY, by Joseph Marie, Philadelphia. Including reference tables of special value to physicians and nurses. Phrases for directing first aid to injured. Articles of pronunciation, European money tables, etc. Copyright, 1918, by P. Blakiston's Son & Co., Philadelphia. Price, 50 cents.

The aim of this little book is to provide the medical words that may be needed by doctors, Red Cross nurses, and others serving in western Europe. The work is especially useful, as most of the terms will not be found in the ordinary dictionaries. Its compactness and small size add to its usefulness.

FRANCIS M. MUNSON.

NEUROPSYCHIATRY AND THE WAR. A Bibliography with Abstracts. Prepared by Mabel Webster Brown, Librarian, the National Committee for Mental Hygiene. Edited by Frankwood E. Williams, M.D., Associate Medical Director, the National Committee for Mental Hygiene. War Work Committee, the National Committee for Mental Hygiene, Inc., 50 Union Square, New York City, 1918.

This work has been prepared in order that the psychiatrists and neurologists in the neuropsychiatric hospital units attached to the base and other military hospitals of the United States Government may have at hand the latest information about the special problems to be met under military conditions. Abstracts of books, parts of books, and of more than 300 articles dealing with the psychiatric aspects of the war have been gathered and prepared. The abstracts are grouped under the countries in the language of which the original books or articles were published. Under each country the material is arranged chronologically, according to the date of publication, so that development of theories, changes of opinion, working out of methods and the like may be traced throughout the progress of the war. A list of eighty-seven periodicals from which abstracts of articles have been made is given on the sub-title pages preceding the literature of each country. The editor states in the preface that the omission of important articles has been unavoidable, as few issues of German medical journals of a date later than 1915 have reached this country, and the receipt of other foreign periodicals has been very irregular.

The book is literally an abstract of all the available knowledge on this important subject and its publication is timely. It is printed on excellent paper, in large type, is of convenient size, and is bound in flexible binding.

FRANCIS M. MUNSON.

Clinical Medicine for Nurses, by Paul H. Ringer, A.B., M.D., Member of the Staff of the Asheville Mission Hospital, Asheville, N. C., and of Biltmore Hospital, Biltmore, N. C. Illustrated. Philadelphia: F. A. Davis Company, 1918. Price, $2.

The book is the substance of lectures delivered at the Asheville Mission Hospital. The object of the author in writing the book is to place in concrete form a fairly detailed description of the points in the various diseases that nurses are expected to observe and interpret, and to form a basis upon which class-room lessons can be assigned and quizzes held, the teacher amplifying as he sees fit. In the opinion of the reviewer, this object has been attained.

The main points dwelt upon are symptoms and their meaning, complications and their detection, as far as the nurse is concerned. Physical signs have not been touched upon, and bacteriology and pathology have been dwelt upon very lightly. Treatment is given in a general manner. The work includes a short chapter on urinalysis, one on immunity, and a useful glossary.

Francis M. Munson.

Massage and the Original Swedish Movements, Their Application to Various Diseases of the Body. Lectures before the Training Schools for Nurses connected with the Hospital of the University of Pennsylvania, German Hospital, Woman's Hospital, Philadelphia Lying-in Charity Hospital, the Philadelphia Polyclinic and College of Graduates in Medicine, and the Kensington Hospital for Women, of Philadelphia. By Kurre W. Ostrom, from the Royal Hospital of Upsala, Sweden. Eighth edition, revised and enlarged. With 125 illustrations. Philadelphia: P. Blakiston's Son & Co. Price, $1.

The revision of this well-known book has been made by P. Silfverberg, G.D., largely from notes left by the late author, Mr. Ostrom. Some additional suggestions on treatment are given and a few modifications of statement have been made necessary by later experience. The new edition contains sixteen new pictures, and some of the old ones have been altered, redrawn or enlarged.

Francis M. Munson.

Medical Diseases of the War, by Arthur F. Hurst, M.A. (Oxon.), F.R.C.P.; Temporary Major, R. A. M. C., Physician and Neurologist to Guy's Hospital; Officer Commanding Seale-Hayne Hospital for Functional Nervous Disorders, Newton Abbot; Lately Member Medical Advisory Committee, Mediterranean Expeditionary Force; Consulting Physician to the Salonica Army; Neurologist to the Royal Victoria Hospital, Netley. Second edition, second impression. Six plates. London: Edward Arnold, 1918. Price, $4.

This book is divided into two parts. The first, comprising eleven chapters, is devoted to war neuroses, a subject on which the author is well qualified to write. Only fifteen pages are devoted to shell-shock, a disproportionately short space to be allotted to such an important and timely subject. Part two treats of infective and other disorders, most of which are well and thoroughly discussed. The work went to press too soon to embody the conclusions reached by the Medical Research Committee of the American

Red Cross on trench fever. The chapter on gas-poisoning considers only that produced by heavy gases set free in the enemy's trenches to drift with the wind. The author has not made use of information that was available in March, 1918, the time the second edition was completed. The illustrations, comprising microphotographs and photographs of war neuroses, are excellent.

FRANCIS M. MUNSON.

A COMPEND OF GENITOURINARY DISEASES AND SYPHILIS, Including Their Surgery and Treatment, by Charles S. Hirsch, M.D., Urologist to the Jewish Hospital and Mt. Sinai Hospital, Philadelphia. Third edition, revised. With 59 illustrations. Philadelphia: P. Blakiston's Son & Co. Price, $1.50.

In the third edition of this useful little compend the author has made numerous and important changes in the text and brought it up to date. The best and improved methods of treatment and diagnosis are given and the illustrations are good. As an epitome of the matter in the standard textbooks this compend will continue its usefulness to student and practitioner.

FRANCIS M. MUNSON.

GUNSHOT FRACTURES OF THE EXTREMITIES, by Joseph A. Blake, Lieutenant Colonel, Medical Corps, United States Army. Masson et Cie, Editeurs. Libraires de l'Académie de Médecine, 120 Boulevard Saint-Germain, Paris, 1918. With 40 original illustrations.

In the opinion of the reviewer this little manual is written by the man best qualified to write it. Colonel Blake has been in command of hospitals largely devoted to the treatment of fractures since the beginning of the Great War, and his work in France has shed luster on American surgery. He demonstrates in detail the method to which has been given his name, describing the apparatus and procedures of treatment.

The book comprises two sections and has six chapters with the following headings: Section I. General—Mechanism and Varieties of Gunshot Fractures; Chapter II. Repair of Fractures; Chapter III. Transport and Operative Treatment of Fractures in General; Chapter IV. Mechanical Treatment.

Section II. Special Fractures—Chapter V. Diaphyseal Fractures; Chapter VI. Fractures and Wounds of Joints.

It is convenient in size, printed on good paper, and the illustrations are all that could be desired.

FRANCIS M. MUNSON.

PAPER WORK OF THE MEDICAL DEPARTMENT OF THE UNITED STATES ARMY—A Guide for Administrative Work, by Ralph W. Webster, M.D., Ph.D., Major, Medical Corps, U. S. Army. Approved for Publication by direction of the Surgeon General of the United States Army. Philadelphia: P. Blakiston's Son and Co.

Major Webster has rendered a genuine service to the medical officers of the Army, especially those of the Medical Reserve Corps, in placing this enlightening volume at their disposal. Many a weary and irritating hour will be saved by carefully following the directions so painstakingly prepared. Practically all the most important papers that the medical officer is called upon to handle are described, and many of them are reproduced in the pages

of this book. Every phase of administrative work is covered, and the reviewer feels sure that, with this compilation as a guide, the daily routine of the newly appointed medical officer will be rendered somewhat less irksome.

FRANCIS M. MUNSON.

THE DISABLED SOLDIER, by Douglas C. McMurtrie, Director, Red Cross Institute for Crippled and Disabled Men. With an introduction by Jeremiah Milbank, Vice-Chairman, Committee of Direction, Red Cross Institute for Crippled and Disabled Men. New York: The Macmillan Company, 1919. Price, $2.

The rehabilitation of the disabled soldier and marine is a subject that is now engaging the thoughtful attention and earnest effort of men and women in both hemispheres. This volume presents to the general reader for the first time the theory and practice of the new science of human reconstruction. The field covered is a large one, therefore the treatment of the subject is necessarily elemental. Particular attention is given to vocational training of disabled men for occupations which they can follow in spite of their disabilities, thereby retaining their self-respect and at the time preserving them from the human scrap heap. The book is written in an interesting manner and contains numerous full-page illustrations.

FRANCIS M. MUNSON.

A HANDBOOK OF COLLOID-CHEMISTRY—The recognition of colloids, the theory of colloids, and their general physico-chemical properties, by Dr. Wolfgang Ostwald, Privatdozent in the University of Leipzig. Second English Edition, translated from the Third German Edition. By Dr. Martin H. Fischer, Professor of Physiology in the University of Cincinnati. Numerous notes added by Emil Hatschek, Cass Institute, London; 63 illustrations. Philadelphia: P. Blakiston's Sons and Co., 1919. Price, $3.50.

The second English edition of this authoritative work brings up to date the original translation. The translators have left untouched the portions of the volume which contain the author's individual views. Some errors in quotation and in mathematical formulae present in the original text have been corrected. Numerous paragraphs have been added bearing upon the various important advances in colloid-chemistry which have been recently made, especially those referring to the mechanical properties of colloids. The illustrations are numerous and well executed.

FRANCIS M. MUNSON.

PERSONAL HYGIENE AND HOME NURSING—A Practical Text for Girls and Women for Home and School Use, by Louisa C. Lippitt, R. N. Illustrated. New World Science Series. Edited by John W. Ritchie. Yonkers-on-Hudson, New York; World Book Company, 1919. Price, $1.28.

Miss Lippitt has written a handy little manual that presents in a very practical way the most important aspects of personal hygiene that are of special importance to girls and women and is at the same time an excellent text-book on home nursing. The latter feature is especially valuable at this

time when so many graduate nurses are serving with the colors. The book would serve a useful purpose in girls' schools. It is of convenient size and well illustrated.

FRANCIS M. MUNSON.

HEALTH ALMANAC

One of the almanacs of the sixteenth century bore the following title:

"Pronostycacyon of Mayster John Thybault, medycyner and astronomer of the Emperyall Majestie, of the year of Our Lorde God MCCCCCXXXIJ., comprehending the iij partes of this yere, and of the influence of the mone, of peas and warre, and of *the sykenesses of this yere*, with the constellacions of them that be under the vij planettes, and the revolucions of Kynges and princes, and of the eclipses and comets."

We are still prognosticating on the subjects of "peas and warre, and the revolucions of Kynges and princes," but the United States Public Health Service in its *Health Almanac for* 1919 is not content with chronicling our various ills, but preaches prevention of the "sykenesses of this yere."

In addition to the monthly calendar of health hints and notable events, this almanac discusses such topics as the following: Control and Prevention of Infectious Diseases, as Pneumonia, Common Colds, Tuberculosis, Infantile Paralysis, Typhoid Fever, Smallpox, Trachoma, Hookworm Disease, and Venereal Diseases; Disposal of Human Excreta; Importance of Clean Drinking Water; Care of the Teeth; Care of Milk in the Home; What the U. S. Public Health Service is Doing to Protect the Health of the People of the United States.

Copies of the 1919 almanac may be obtained free upon application to the U. S. Public Health Bureau, No. 3 B Street S.E., Washington, D. C.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

WAR SURGERY FROM FIRING LINE TO BASE, by Basil Hughes, D.S.O., M.A., M.B., B.C. (Cantab.), B.Sc. (Lond.), F.R.C.S., Temporary Major, R. A. M. C., T. F., and Stanley Banks, M.A., M.B., Ch.B. (Glasg.), D.P.H. (Cantab.), Captain R. A. M. C., T. C., with special chapters by Lieut. Col. L. F. Smith, C.M.G., R. A. M. C., and Miss C. Bilton, R. R. C., Q. A. I. M. N. S., and an Introduction by Col. Sir T. Crisp English, R.C.M.G., F.R.C.S. A.M.S., Consulting Surgeon to the British Forces in Italy, New York; William Wood & Company, 1919. Price, $9.00.

THE DISABLED SOLDIER, by Douglas C. McMurtrie, Director, Red Cross Institute for Crippled and Disabled Men. With an Introduction by Jeremiah Milbank, Vice-Chairman, Committee of Direction, Red Cross Institute for Crippled and Disabled Men. New York: The Macmillan Company, 1919. Price, $2.00.

SURGERY IN WAR, by Alfred J. Hull, F.R.C.S., Lieut. Col. R. A. M. C. With a Preface by Lieut. Gen. T. H. J. C. Goodwin, C.B., C.M.G., D.S.O., Director-General, Army Medical Service. Second Edition, with 210 Illustrations. Philadelphia: P. Blakiston's Son & Co., 1919. Price, $6.00.

A HANDBOOK OF COLLOID-CHEMISTRY—The Recognition of Colloids, the Theory of Colloids, and Their General Physico-Chemical Properties, by Dr. Wolfgang Ostwalt, President in the University of Leipzig, and Dr. Martin H. Fischer, Professor of Physiology in the University of Cincinnati, with numerous notes added by Emil Hatschek, Cass Institute, London. With 63 illustrations. Philadelphia: P. Blakiston's Son & Co., 1919. Price, $3.50.

THE WHOLE DUTY OF THE REGIMENTAL MEDICAL OFFICER, by Capt. P. Wood, R. A. M. C. London, England: Forster Groom & Co., Ltd. Price, 2s. 6d.

A B C OF AVIATION, by Capt. Victor W. Page, Sig. R. C., Aviation Section. Illustrated. New York: The Norman W. Henley Publishing Co. Price, $2.50.

The Henry S. Wellcome Prizes

Competition open to all medical officers and former medical officers of the Army, Navy, Public Health Service, Organized Militia, U. S. Volunteers, and of the Reserves of the United States:

PRIZE FIRST: A GOLD MEDAL AND $300
PRIZE SECOND: A SILVER MEDAL AND $200

Competition for 1919 will be based on essays on prescribed subjects which will be announced later.

Each competitor must furnish five copies of his competitive essay. Essays must not be signed with the true name of the writer, but are to be identified by a *nom de plume* or distinctive device. They must be forwarded to the Secretary of The Association of Military Surgeons of the United States, Army Medical Museum, Washington, D. C., so as to arrive at a date not later than **September 15, 1919,** and be accompanied by a sealed envelope marked on the outside with the fictitious name or device assumed by the writer and enclosing his true name, title and address. Essays must contain not less than 5,000 or more than 20,000 words, exclusive of tables. The envelopes accompanying the winning essays will be opened at the annual, or other meeting, by the president, and the names of the successful contestants announced by him. The winning essays become the property of The Association and will be published in THE MILITARY SURGEON. The writers of the essays receiving "first honorable mention" will be awarded life membership in The Association of Military Surgeons, U. S.

INSTRUMENTS AND APPLIANCES

COMBINED CALVARIUM HOOK AND CHISEL[1]

By Captain THEO. I. TOWNSEND

Medical Corps, United States Army

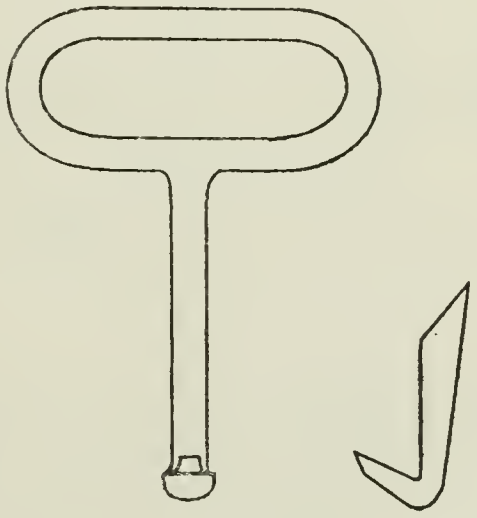
(With one illustration)

Caliber of shank and handle, 3/8-inch (about 0.9 cm.).

Length of shank, 3¼ inches (about 8.2 cm.).

Handle, round, inside dimensions of loop, 1 1-16 inches by 3¼ inches (about 2.6 cm. by 0.5 cm.).

Hook, flat on upper surface, set at a slightly acute angle to the shank, 7-16-inch long, ½-inch wide (about 1.1 cm. by 1.2 cm.); 1/8-inch thick (about 0.3 cm.), tapering to the chisel edge, which must be on the lower surface.



These dimensions may vary slightly, but should not be less.

The instrument should be made of tough steel, handle and shank preferably round, and all parts smoothly nickel-plated.

Advantages.—The shank of the instrument forms a guard so that the chisel does not penetrate or injure the dura; the hook is so broad that it does not injure the edges of the skull; this breadth of hook and the formation of the handle, which admits insertion of the hand into its loop, affords strong prying leverage, and strong direct traction for removal of the calvarium; it does away with the straight-shanked chisel, and the common small calvarium hook

[1] Not patented.

attached to a hammer with a sharp edged head; rubber gloves, therefore, are never injured by it.

A small but heavy copper-headed hammer is the best to use with this combined hook and chisel, which is easily inserted in the saw-cut through the external table of the skull; a few smart taps with the hammer on the back of the chisel quickly and safely break the internal table of the skull, and the calvarium is readily removed by traction with the hook.

One of these instruments, devised by me, and made of toe-calk steel by a blacksmith, has been in satisfactory use for six years in the Binghamton (N. Y.) State Hospital, and is still in good condition, although used in over a hundred autopsies annually.

The pathological laboratory technician, who has struggled with the old-fashioned straight chisel and the old-fashioned calvarium hook, will immediately appreciate the superiority of this instrument on trial.

SPLINT FOR PARALYSIS OF ANTERIOR AND POSTERIOR LEG MUSCLES

By Lieutenant W. W. LASHER
Medical Corps, United States Army

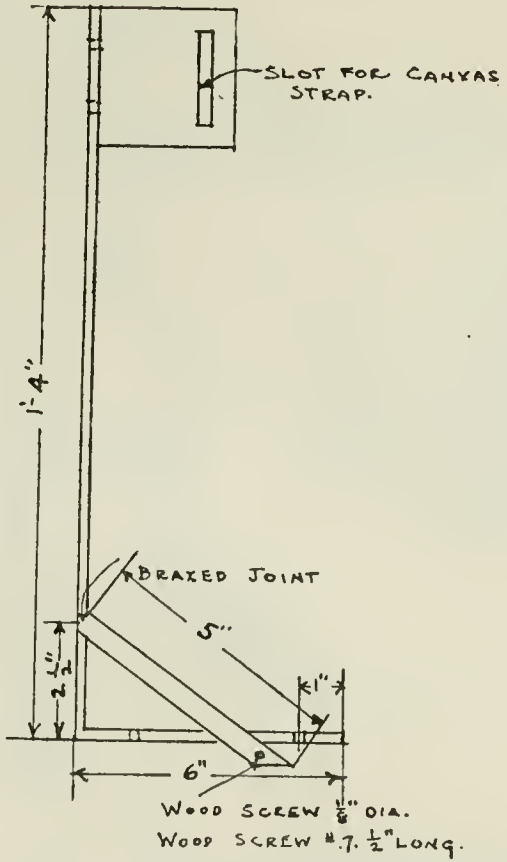
(With two illustrations)

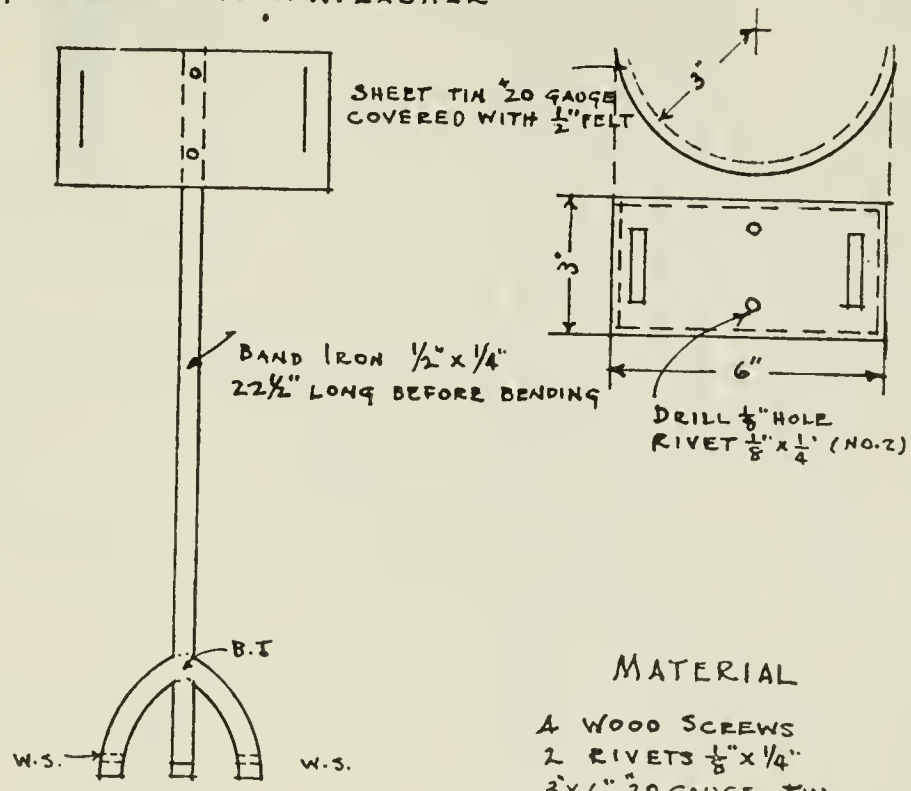
The accompanying diagrams illustrate this simple device sufficiently well so that a detailed description is not deemed necessary. The measurements, as is obvious, may readily be altered to suit the individual case. It might also be stated that an attempt was made to omit the lateral braces attached to the heel, but this resulted in weakening the splint angle. There remains, therefore, only a necessity for discussing the advantages of this simple brace over the numerous and more complicated appliances designed for a similar purpose.

First, and of primary importance, the very simplicity of the splint makes its construction easy and allows it to be applied readily to the regulation army shoe. If worn beneath the woolen spiral leggings its presence is not noticeable. This fact, though of no surgical importance, will be a source of considerable appreciation to most patients.

SPLINT FOR PARALYSIS OF ANTERIOR AND POSTERIOR LEG MUSCLES.

DESIGNED BY LIEUT. W. W. LASHER





MATERIAL

4 WOOD SCREWS
2 RIVETS ⅛" x ¼"
3" x 6" #20 GAUGE TIN.
3" x 6" FELT WADDING
CANVAS STRAP (WITH BUCKLE) 12" x 1½"
BAND IRON 11" x ½" x ⅛"

Secondly, the portion of the brace beneath the sole has not been extended forward so as to limit or interfere with the motion of the metatarso-phalangeal joints. As a result, walking permits "active exercise against resistance" to be given to the muscles of the foot, and prevents the occurrence of arthritis and ankylosis, so often noticed in the metatarsal and inter-phalangeal joints.

As has been practically demonstrated in a case of complete bilateral severance of the sciatic nerves, with resulting paralysis in both the anterior and posterior leg muscles, this simple splint lends sufficient stability and allows the patient to walk with only a slightly perceptible limp. The above mentioned patient now mounts and descends stairs with only moderate difficulty, whereas, before the brace was applied, walking was almost impossible.

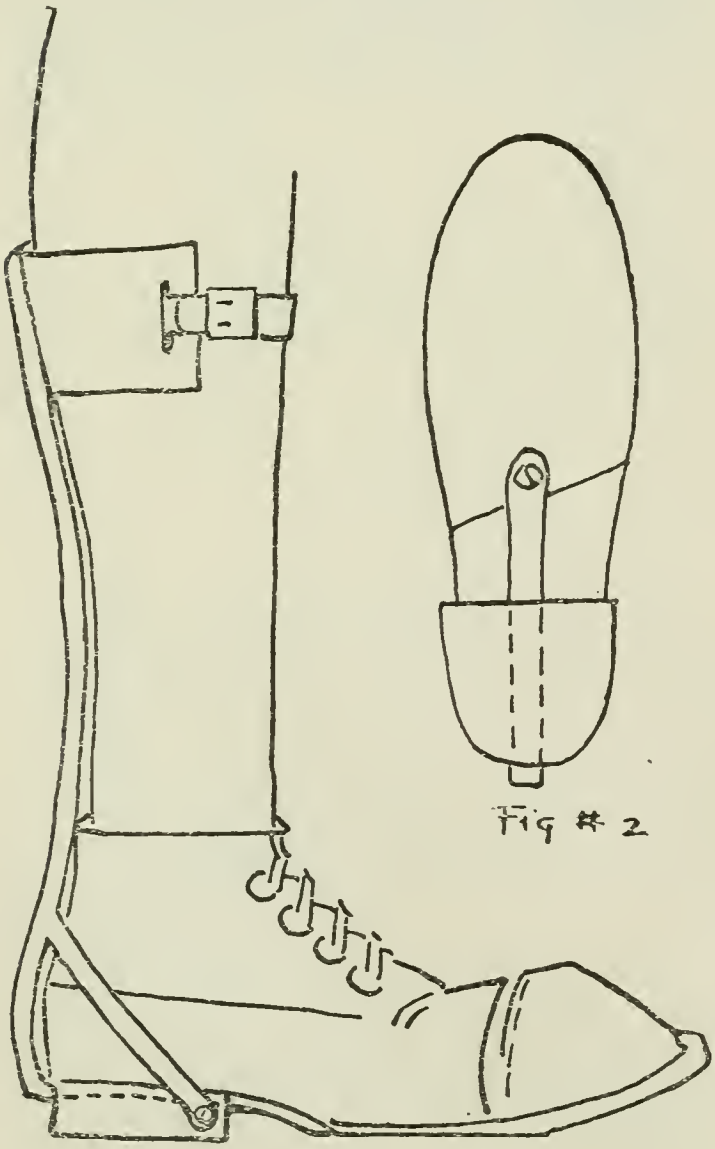


Fig # 1

Fig # 2

Fig # 3

It has been found that, instead of attaching the lateral heel plates by means of wood screws, they may be more securely attached by passing a rod through the heel and riveting it at either end; this increases the lateral stability of this type of splint. A steel rod 3½ inches long and ⅛ inch in diameter may be used.

It is obvious that shoes should be fitted *as soon as possible* in all patients who have been off their feet for any considerable length of time. The atrophy of disuse causes stretching of the muscles and tendons which may result in permanent disability. In this condition a splint of this type will be found especially advantageous.

An apparatus described by Maj. R. W. Lovett acts upon a somewhat similar principle, but requires a hinge joint in the region of the ankle. The splint designed by Lieut. Col. R. B. Osgood is applied to the dorsum of the foot, evidently more especially constructed for recumbent cases. Several other varieties of foot drop splints also are not capable of being built into, or attached to, the regulation army shoe.

Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

Capt. Henry G. Beyer, M. C., U. S. N., Retired.
Died December 10, 1918.

Maj. Emile Louis Delanney, M. C., U. S. A.
Died December 24, 1918.

1st Lieut. Wade H. Esslinger, M. C., U. S. A.
Died October 7, 1918.

Capt. George H. Hockett, M. C., U. S. A.
Died December 1, 1918.

Lieut. Col. Carl Edward Holmberg, M. C., U. S. A.
Died January 1, 1919.

1st Lieut. Jerome McKaig Leonard, M. C., U. S. A.
Killed in action, November 8, 1918.

1st Lieut. Leo Cassius Miller, M. C., U. S. A.
Died December 14, 1918.

Capt. R. B. Underwood, M. C., N. G., U. S. A.
Died November 13, 1918.

THE
MILITARY SURGEON

VOL. XLIV APRIL, 1919 Number 4

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

MANAGEMENT OF VENEREAL DISEASE AT CAMP MEADE, MD.

BY LIEUT. COL. GUY L. QUALLS AND CAPT. S. L. MEYLACKSON
Medical Corps, United States Army

(With two illustrations)

VENEREAL disease is probably one of the most difficult features that the Medical Department has had to cope with. It not only causes a tremendous non-effective rate, but interferes with the proper training of men, and causes a drain upon the medical personnel in taxing their services severely.

Recent statistics published by the Surgeon General's Office[1] reveal the following interesting data:

(*a*) During the fifty-three weeks ending September 27, 1918, there have been reported 178,204 venereal disease cases under treatment in the United States Army in this country.

(*b*) Reports indicate that approximately 85 per cent of this number entered the Army already infected, and that in approximately 15 per cent of cases the infection was contracted after enlistment.

(*c*) During 1917 over 750,000 days were lost to the Army because of venereal diseases. During the last fifty-three weeks there has been a loss of over 2,067,000 days.

Many of us have been greatly surprised at the amazing prevalence of venereal disease in civilian life, as shown at the initial physical examination of draftees upon their arrival at cantonments. The figures naturally vary according to geographical location, social conditions, environment, etc. Where negro recruits enter into consideration a very much higher rate will always be found. During April we received from Tennessee a group of 2,287 negroes, of

[1] Circular letter, S. G. O., October 19, 1918.

whom 889 (38.87 per cent) were infected, as follows: Gonorrhea, 616; chancroid, 14; mixed, 58; syphilis, 201. Among the white recruits, the average is about 8.9 per cent; the July and August drafts furnish fairly typical figures. Of a total quota of 12,045, there were found 1,220 cases (9.6 per cent) of venereal disease, distributed as follows: Gonorrhea, 835; chancroid, 14; mixed, 10; syphilis, 361.

It seems very timely, therefore, to recount in detail the system of handling the situation at Camp Meade, where venereal diseases constituted one of the most formidable problems.

Last fall, when the draftees began arriving at this camp, physical inspection revealed several hundred cases of venereal disease, contracted prior to induction into service. There were no facilities for coping with this situation. Under the direction of Maj. Charles N. Williams, of the 79th Division, two large latrines were immediately opened, where over 600 cases of gonorrhea and syphilis were treated. Great credit must be given to Major Williams, who really fathered the venereal station system in the Army. He foresaw the practical impossibility of treating cases in such numbers at the base hospital and arranged for the treatment of all subacute and chronic cases of gonorrhea and for follow-up treatment of syphilis in clinics (later termed venereal stations). There were few facilities for the treatment of a large number of venereal patients and so crude but effective work was performed. Gonorrheal cases were treated with protargol or zinc hand injections in addition to internal medication. The syphilitics were given mercurial inunctions with local dressings. Provision for these cases was lacking at the base hospital, as the wards were then only in process of construction. Surprising to relate, these crude measures were quite effective in the majority of cases, and many of the open lesions were healed and quite a number of gonorrheal cases improved or were discharged.

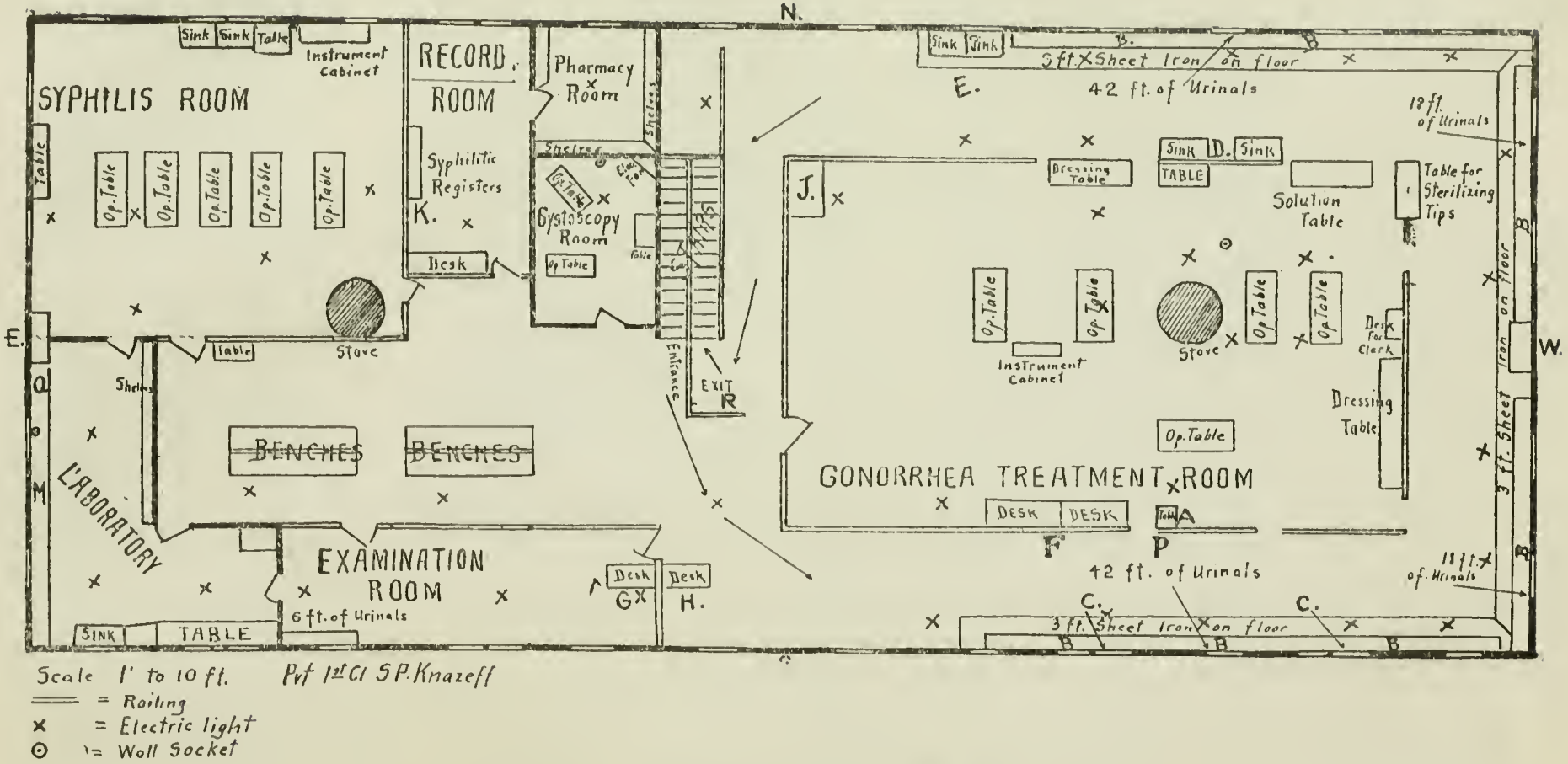
However, it was recognized that more radical measures, adequate buildings and organization would have to be secured. Accordingly in each of three regimental infirmaries a room was secured exclusively for venereal work. The medical officer in charge was a trained worker and two enlisted men were assigned to him as assistants. This system worked fairly well, but after a short experience it was realized that it was but a makeshift. Almost every unit contained some venereals, and, although attempts were made to standardize the treatment and system in these infirmaries, it was seen that the weak link was the depot brigade. All the

recruits upon coming into the camp were first assigned to the depot brigade; after a course of three weeks or more they were transferred to combatant units of the division. Naturally the venereals were thus scattered in the various units, causing no little difficulty and endless confusion.

It was apparent that, as successive drafts would materialize, the limited facilities of the venereal station would be taxed to the utmost. Lack of proper personnel was an additional serious handicap; no provision had been made to assign a permanent trained personnel. It was thought wisest, therefore, to attack the problem at its weak link, and a venereal station was opened in the depot brigade in March. The lower floor of a small barrack was secured. Urinals were fitted on three sides, and a modest genito-urinary outfit was installed. A small room on one side served as a laboratory, where routine smears, dark field and urine examinations were made. Two medical officers and five enlisted men were assigned to the station.

The number of inspected was augmented at each influx of recruits, necessitating that we take over the whole building and enlarge our facilities. The personnel increased to six medical officers and twenty-three enlisted men. Several improvements for the intensive treatment of venereals, such as cystoscopic and endoscopic rooms, and a room for the administration of salvarsan were added. The office was enlarged to take care of the great amount of detail paper work. Venereal companies were instituted and, finally, venereal battalions were formed in the latter part of April. These companies were made up entirely of venereals who were picked up in the depot brigade and transferred into gonorrheal or syphilitic companies. In a short time the two venereal battalions that had been formed were unable to absorb the great number of venereals assigned to them.

Shortly afterwards the 79th Division transferred all their venereals to these venereal companies. The number of new cases among the draft quotas, in addition to those cases transferred from the division, outnumbered by far the number that were being cured each week; it was rather fortunate that about this time development battalions were formed. It had been foreseen that some method would have to be devised whereby the venereals in the camp could be segregated to a larger degree, although in a manner similar to that instituted with the venereal battalions. The venereal



Scale 1' to 10 ft. Pvt 1st Cl S.P. Knazeff

= Railing

× = Electric light

⊙ = Wall Socket

FIG. 1.—PLAN OF VENEREAL STATION B26, CAMP MEADE, MD.

A. Medical officer examines urine here.
B. Irrigators hang here.
C. Shelf for glasses.
D. All hand injections given here.
E. Antiseptic solution and roll of toilet paper for cleaning hands.
F. All men report their treatment here.
G. Desk for med. officer examining cases.
H. Desk for clerk.
J. No case and discharge clerk.
K. Syphilitic register file.
M. Dark field illumination.
O. Centrifuge.
P. Table for tags.
R. Orderly for tags.

station was then moved to the center of the camp, where a large barrack building was converted for our use.

Fig. 1 shows the plan of the station. The lower floor contains a large administration room where all permanent records are filed and where all clerical work and correspondence are performed. It contains room for the commanding officer, first sergeant, and a staff of clerks. One entire side of the building is utilized as a waiting room and is railed off so that as the men report, the attendance sheets are marked off at desks. A stairway leads directly from waiting room to the upper floor of the building which is utilized for treatment rooms. It has been found more efficient to have the entire floor space railed off to divide the various departments; this makes it possible for the man in charge to see the entire plant and insures better work. The laboratory, cystoscopy room, and pharmacy are the only departments partitioned. The gonorrheal treatment room has urinals on three sides; forty irrigators are suspended over two sides of this room, the third side being utilized for the purpose of urine glass tests. Several operating tables, sterilizers, an instrument cabinet, and all necessary instruments are located within the railings in this room, where the patients needing special types of treatment are isolated. The examination room, in charge of a medical officer with clerk, is located immediately at the head of the stairs, and all new cases are examined here. A urinal is located in this room for the purpose of making ordinary urine glass tests. It is in close proximity to the laboratory, where the necessary tests can be quickly performed. The laboratory is equipped with filing cabinets, microscopic outfits, dark field illuminators, etc., for the examination of urine, exudates, and smears. An efficient index system is kept for all laboratory examinations made. About 50 smears are made daily by trained technicians under the direction of a medical officer; about 500 chemical and microscopic examinations are made weekly. The number of dark-field illuminations vary from 30 to 100 per week. In addition, the ordinary routine laboratory work is also performed.

CYSTOSCOPY AND ENDOSCOPY ROOM

This is equipped with two tables (one for cystoscopic work, the other for endoscopic work), two rheostats and wall sockets in a dark room. The equipment consists of a complete Brown-Buerger cystoscope and two Young endoscopes with accessories. The importance of this class of work cannot be overestimated. The cystoscope is a very valuable adjunct in the examination of enuresis

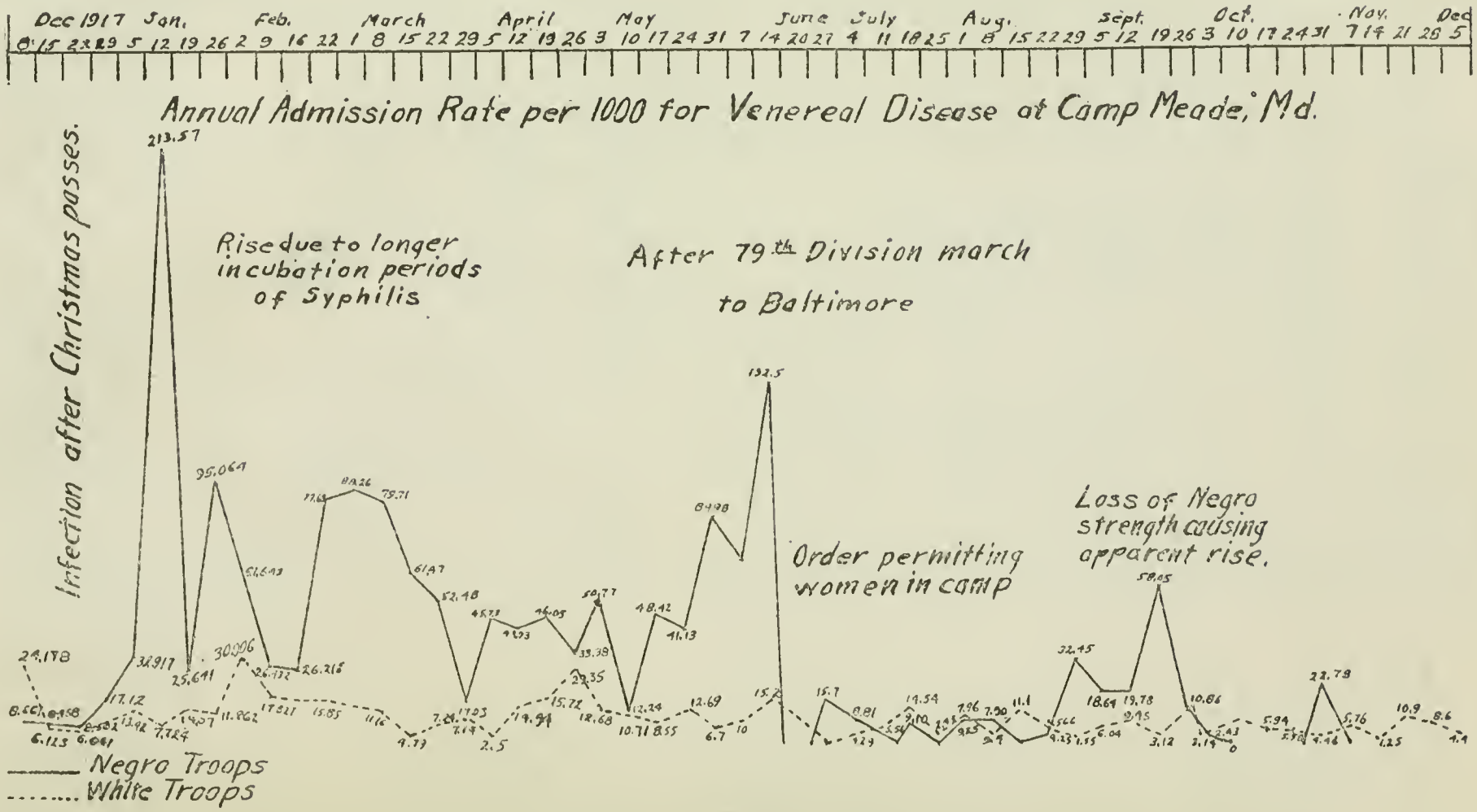

Dec 1917 Jan. Feb. March April May June July Aug. Sept. Oct. Nov. Dec
Annual Admission Rate per 1000 for Venereal Disease at Camp Meade, Md.
Infection after Christmas passes.
Rise due to longer incubation periods of Syphilis
After 79th Division march to Baltimore
Order permitting women in camp
Loss of Negro strength causing apparent rise.
213.57
95.064
30006
132.5
58.05
Negro Troops
White Troops

Fig. 2

cases; there being a surprising number of these in all camps. Most of the cases of enuresis are looked upon with suspicion by both line and medical officers. They constitute a disagreeable class of patients; however, although some may be malingering, a great number show definite pathological changes when examined by the cystoscope. This has been discovered in a series of cases by Lieut. I. Pelzman, who will shortly publish the results of his investigation.

SYPHILIS ROOM

This room, adjoining the record room and laboratory, is located in the eastern section of the building and is equipped with five operating tables and instrument cabinet. The system employed will be described later. The syphilitic record room contains a filing system where syphilitic registers are filed alphabetically. One medical officer and two clerks are stationed here. The medical officer in charge has entire control of the treatment of syphilis and is responsible for the records entrusted to his care. A check-up system is employed whereby all syphilitic registers (Form 78) received by and sent from this department are accounted for.

PHARMACY

This is a small room where all drugs are stored, and is in charge of a trained pharmacist, who is also supply sergeant responsible for all supplies and for an adequate supply of all materials necessary for the proper maintenance of the station without interruption. He is in charge of a check-up system of the monthly cost of supplies, usually approximating $800 to $1,000.

PERSONNEL

This station is under the command of the Assistant to the Camp Surgeon in Charge of Control of Venereal Disease. Associated with him are six medical officers, trained in the treatment of venereal disease, and thirty enlisted men. From time to time medical officers have been sent for training in this specialty. It is rather interesting to relate how quickly such men can become skilled in treating venereal disease, for the opportunities of observing gonorrhea and its complications and syphilis are abundant and far superior to any civilian clinic. The noncommissioned personnel consists of one first-class sergeant, four sergeants, and six first-class privates. Quarters for these men are provided in a separate squad room; this insures proper discipline, cleanliness of the building, promotes interest in the work, and allows uninterrupted operation. The en-

listed men are exceptionally well trained by lectures and demonstrations to make them efficient and capable.

SYSTEM

When venereals are discovered during the initial physical examinations of recruits, a list is sent to the venereal station. These men are examined the next day in the examination room where the necessary urine tests, urethral smears, and dark-field examinations determine the diagnosis. The examination room is in close proximity to the laboratory, in order that the necessary tests can easily be performed. As soon as the diagnosis is established, an index card is filled out, giving name, rank, company, organization, date of appearance, and diagnosis of case. This is placed in the file in the administration office and constitutes a permanent record. In addition, a case history card is made which is kept in the treatment index file located at desk in gonorrheal treatment room (see Form 2.) This form is very valuable, and is the result of one year's experience with different records. The front of this card contains the necessary history and other data. The reverse contains spaces for noting treatment for ninety days. It obviates the necessity of entering the type of treatment upon each appearance of the patient; all writing is unnecessary, since a check mark shows the type of treatment. It also shows the results of both urine tests for ninety successive days. Any code may be employed to show the character of shreds, particles, and character of urine. In our station certain standard symbols were employed.

One of the most important requirements of successful treatment is regular attendance; poor attendance minimizes the effectiveness of treatment. We have found that where commissioned officers were in charge of and accompanied patients to the station, proper discipline was maintained, and such companies had better records in the long run. It should, therefore, be insisted upon that a commissioned officer be placed in charge of venereal companies reporting for treatment.

In our station the men report in a large waiting room on the lower floor, where clerks call off the names on the attendance sheets (see Form 3) ; the attendance is marked on the original and duplicate sheets; the original sheet is retained by us, and the duplicate constitutes the venereal roster of the companies and is kept in their office. The men then file upstairs, where they line up in the gonorrhea treatment room, urinate in glasses at large urinals situated at the southern side of this room. The medical officers sit at desks at

"F"; they observe the character of urine, etc., and prescribe treatment. Large filing systems are located here and, as the men approach, their cards are taken out of the files which are arranged according to companies and organizations. The medical officers, after consulting the patients and observing the character of the urine as recorded upon the reverse side of the history card (Form 2), prescribe treatment. A check mark eliminates writing, and it is so simple that any clerk can merely hear the notation made by the medical officer and check off the treatment, as called for. As the officer directs the treatment an orderly fastens a tag labeled with type of treatment ordered. This is an ordinary cardboard disk with a metal rim to be suspended from a button by means of a loop of cord. The men then repair for treatment to the orderlies or officers as specified. The disks eliminate the necessity of verbal orders and do away with the possibility of men evading treatment—a trick that negroes are apt to play. No patient can leave the building unless he has been given another tag marked O. K. after culmination of treatment by officer or orderly. These precautions may seem somewhat elaborate, but it is surprising how men will try to evade instrumentation and to substitute another type of treatment more pleasant. When one has to deal with development battalion cases, there will always be a certain number of men who do not desire to be cured. When combatant units were filled up from the ranks of cured patients, some few men (we are glad to state their number was small) tried to evade treatment to escape being sent abroad.

At this station there are forty can irrigators suspended from the wall by rope and pulley arrangement. The tips are plain metal nozzles, with ordinary clip cut-off. This simple affair has proved rather ideal and far superior to Valentine irrigators. The objection to the latter is that they are cumbersome and difficult for patients to use themselves. The metal irrigator nozzles are sterilized after being used. Patients receive them from the orderly in charge of the sterilizers, and they are returned to him after completion of treatment. The men receiving irrigations stand up against the ordinary urinal troughs. There should be no objection to patients receiving irrigations in a standing position; the idea that men should be in a sitting or prone position is entirely fallacious. All the orderlies are trained so that they become very adept in irrigating and, after a short time, patients very readily perform this themselves. The men who are getting along well receive the ordinary

routine treatment by irrigations of potassium permanganate, silver nitrate, etc., and ordinary hand injections of protargol, zinc sulphate, etc. Those cases which, upon examination, show the necessity of intensive treatment are taken within the railing, where several tables are located, and are given treatment by instillations, dilatations, and such instrumental measures as may be indicated (Fig. 1). Cases needing endoscopic examination and treatment are sent into the endoscopy room for the proper treatment.

Hand injections are given by glass syringes, which are immediately sterilized by boiling in an electric sterilizer after use. A table is used for the purpose of dressings. We believe it is very important to pay rigid attention to asepsis; by this we are sure many of the complications of gonorrhea can be avoided. Men completing treatment receive an O. K. tag, which permits them to leave the building. These tags are surrendered to an orderly who stands at "R" (Fig. 1). Upon superficial examination the above system appears formidable, but it is surprising how quickly entire companies can be rushed through. We have easily put through over 500 cases in an hour, and, if necessary, we could dispose of more.

The salient feature in this system is that very few need intensive treatment. The majority get along remarkably well, and the average length of time to discharge a gonorrhea patient is from four to seven weeks. Some cases are difficult and resist treatment in an obstinate manner; these generally take a few months to clear up. It must be understood, however, that in all acute cases and complications of gonorrhea and open syphilitic lesions, patients are sent to the base hospital for the first period of treatment. After discharge from the base hospital they continue treatment at the venereal station. The majority of men do full military duty in accordance with schedules worked out by the line commander and approved by us. It must be remembered, however, that when venereal cases are given classification examination upon entrance into the development battalions, this is entered upon the personnel cards. If for any reason patients are judged incapable of performing full duty they are given class D slips signifying that they should be given but one hour's work a day. This obviates the necessity of marking men "quarters" and does away with a lot of unnecessary paper work. The slips are surrendered to the company officers, are good for one day, and are repeatedly issued as seem fit. In other words, men without slips may be given full military duty in accordance with the schedule of the development battalions.

Entire companies receive their treatment according to a time schedule prepared and must report at the time specified; the time of arrival and departure of each company is checked up daily. In this manner no complaints are made by the line officers relative to men lingering for treatment. Twenty minutes, as a rule, are given over to each company, and it can easily be seen that this engenders little interference with the military duties of venereals. The schedule of duty for these men does not interfere with the cure of their disease, and in many cases a certain amount of duty constitutes a part of the treatment.

SYPHILIS TREATMENT

A recent ruling of the Surgeon General's Office calls for six injections of salvarsan and ten to twelve mercurial injections of insoluble mercury in a course of treatment. This ruling has been followed up here. We average 400 injections of salvarsan per week. Five tables for the administration of salvarsan are used; each table has a medical officer and an orderly assigned to it (Fig. 1). Salvarsan is given by gravity, and 25 c.c. of water are used to dissolve each decigram. One medical officer's sole duty is to make up solutions in bulk, with one orderly to assist him. Another medical officer makes a physical examination of each patient before the administration of salvarsan, and a urine test is also made every time one reports for an injection.

The whole procedure requires only a few minutes for each man. One orderly attends to the sterilization of the site of injections; the patient then gets on a table, where the injections are given. After the injection is administered he reports to another orderly who dresses the arm. A railing is so situated that every man in going out reports at a desk at the exit, where his register is filled in, noting the treatment received. Every man receiving an injection of salvarsan is excused from all formations for twenty-four hours. Each syphilitic company reports on a separate afternoon for injections of mercury. Gray oil or mercury salicylate is used. Before each injection the mouth is examined, and cases found salivated are excused from treatment and are given appropriate medication.

Those in good condition report at the desk for their syphilitic register (Form 78), go into the treatment room for an injection of mercury, and in passing out leave their registers at the desk for notation of the treatment. After a patient has received the prescribed course of treatment, is negative as far as open lesions are

concerned, and not in an infectious state, he is classed as "fit for transfer."

A persistent two plus Wassermann should not interfere with transfer to a combatant unit. It should be remembered that the function of the Medical Department in time of war is to make soldiers fit. The problem of syphilitic treatment resolves itself into the mechanical factor of giving the men the initial course of treatment so as to make them noninfectious, removing the possible menace of communicating the disease to their fellows. If a syphilitic has had the first course of treatment, in a majority of instances this puts him into a non-infectious state and he should be allowed to go to combatant units. It is then the duty of the regimental surgeon to follow up the case and to recommend additional courses of treatment when indicated.

WASSERMANN TESTS

Several hundred Wassermann tests were made weekly during the height of the draft periods. The men line up in a long column, their arms sterilized, and the blood is taken by ordinary medium gauged needles and allowed to flow into small glass tubes. Each man is assigned a number, which is noted on the Wassermann card (Form 55 Q) and on the tube containing his blood specimen. All blood is sent to the base hospital and the laboratory reports within two days. Following are the findings in 5,624 Wassermann tests made at this station: 1,804 (32.07 per cent), two plus; 659 (11.73 per cent), one plus; 760 (13.31 per cent), plus minus; 2,401 (42.89 per cent), negative. It is rather interesting to note the number of two plus reactions among men not venereally infected in other companies of the development battalions. Out of a series of 702 Wassermann tests among orthopedic cases there were 32 (4.7 per cent), two plus reactions. We believe that every man in the army should have a Wassermann test.

REPORTS

A report upon the cases discharged for the day is made daily to the commanding officer and the personnel officer of the development battalions, and to surgeons of organizations. The men discharged are kept under observation for two weeks and are given venereal inspection; in case of relapse they are again put under treatment. Two weeks after discharge they are available for transfer. At times we have averaged about 300 men discharged weekly. After syphilitics have received the course of treatment, are non-infectious and in a

negative state, they are also published as fit for transfer, allowing transfer to combatant units.

The following figures give a résumé of six months ending September 30:

TABLE I

New Cases—Negro

Contracted	Gonorrhea	Chancroid	Mixed	Syphilis	Total
Before enlistment	3,359	48	84	1,077	4,568
Since enlistment	55	16	8	42	121
Total	3,414	64	92	1,119	4,689

New Cases—White

Before enlistment	2,998	42	36	498	3,574
Since enlistment	83	13	7	27	130
Total	3,081	55	43	525	3,704

Grand Total.—Before enlistment, 8,142; since enlistment, 251; total, 8,393. This shows that somewhat less than 3 per cent of cases of venereal disease developed since enlistment, of all cases reported.

Cases discharged above period

	Gonorrhea	Chancroid	Syphilis	Total
White	2,070	51	300	2,421
Negro	2,216	80	879	3,175
Total	4,286	131	1,179	5,596

This does not include cases "otherwise disposed of," by deaths from other causes, rejections, and discharges for disability.

Prophylactic Treatments Administered.—White, 3,604; Negro, 9,355; Total, 13,159

Cases Developing after Prophylaxis

	Interval between exposure and prophylactic treatment								
	1 hour	2 hours	3 hours	4 hours	4 to 8	8 to 12	12 to 24	Over 24	Total
Gonorrhea	9	7	6	9	9	13	5	7	65
Chancroid	1	2	.....	1	7	8	6	1	26
Syphilis	1	4	3	3	9	7	6	2	35
Total	11	13	9	13	25	28	17	10	126

TABLE II.—*Fresh Infections*

1918	Syphilis	Gonorrhea	Chancroid	Mixed	Total
April	19	30	8	4	61
May	11	46	5	2	64
June	10	29	2	3	44
July	7	4	4	2	17
August	8	14	3	2	27
September	14	15	7	2	38
Total	69	138	29	15	251

These tables will serve to show some interesting data. In 13,159 prophylactic treatments administered 11 (.008 per cent) contracted venereal disease after prophylaxis within one hour after exposure. Included in this number was one case of syphilis. This is a remarkable exposition of the value of prophylaxis when taken within one hour after exposure. All arguments against prophylaxis are absolutely untenable. This treatment, when administered early in the proper manner, should be an almost safe system.

COMBAT AND CONTROL OF VENEREAL DISEASES

Not only must the officer in charge of this department be active in the treatment of venereal diseases, but he must also be extremely vigilant in the modern phases of the "social problem."

Prostitution has always been with us and now, as never before, the predominating importance of this situation has been brought to attention. The emotional stress and strain incident to war, awaking feminism, the shifting of countless numbers of youths from home environment to army camps, throwing into intimate contact men of different races, creeds and types in the flush of manhood, must be considered.

The old idea that prostitution is a necessary evil is steadily disappearing. The fallacy of segregation, which had its numerous adherents, is giving way to the new and hitherto scorned system of combat and control.

The proximity of Baltimore and Washington to our camp made the problem of combating venereal disease quite difficult, as in all camps adjacent to large cities with fair transportation facilities. Fortunately the extra-cantonment officers, in charge of trained workers of the Sanitary Corps, took this situation in hand with the aid of the Department of Justice and municipal authorities. In order to coöperate with this agency, all men with new infection are

questioned closely and their replies entered on a "Social History Sheet." This contains information as to the name, address and social condition of the woman, with all possible details. Wherever possible details regarding hotels, rooming houses and the liquor question are covered thoroughly. These sheets are sent to our department and the information obtained is sent to the extra-cantonment officers in the various cities and to the military police.

One of the interesting features noticed by Maj. C. N. Williams here was the greater frequency of fresh infection after holidays, when large bodies of troops received passes for a few days.

Fig. 13 shows a chart with the rises in annual admission rates after the holiday passes. Education of the soldiers by pamphlets, exhibition of films (of which "Fit to Fight" is a notable example), lectures by company commanders and skilled lecturers of the Surgeon General's Office, all had their effect in reducing this incidence. We had our doubts of the efficiency of such methods at the beginning, but the figures are incontrovertible and show that education of the soldier, prophylaxis, and control of civilian centers will successfully keep down venereal disease to a minimum.

At the camp surgeon's office an efficient system of filing all venereal notification cards is maintained. All cases of fresh infections are entered upon a separate system of case records. Punishment of men contracting venereal disease through neglect of prophylaxis must be insisted upon, under G. O. 45; to this end all such cases are checked up and the results tabulated. Unless a follow-up system is used, many cases will go unpunished, owing to leniency on the part of some commanders. Punishment by loss of pay and confinement to camp acts as a deterrent to many men.

It must be added that all venereals are confined to the limits of the camp. They cannot receive any passes till cured. In some camps stockades of barbed wire have been employed, with armed guards; this is quite unnecessary. The loss of morale incident to such practice does not compensate for any possible advantages.

Morale is an important and delicate matter. Our venereal companies do not feel like outcasts; the great majority are anxious to be cured and are willing and conscientious. The snap they show in drill and their soldierly qualities have often been commented upon, and many units have been built up upon a foundation of cured venereals.

DIAGNOSIS AND TREATMENT

It seems timely to interject a few remarks relative to the existence of chancroids. We have a very small percentage of chancroidal

cases. This is due primarily to the fact that we make repeated dark-field illumination examinations and repeated Wassermann tests until diagnosis is settled beyond doubt. We have found that officers are prone to call cases with multiple lesions "chancroids." From the enormous amount of cases we have witnessed, it seems that primary syphilis manifests itself in a greater percentage with multiple lesions, especially in the negro, where all sorts of conditions are encountered. Chancre redux is very prevalent in the negro race, as are also mixed infections.

One of the difficult features we encountered among the colored draftees especially was phimosis following chancroidal, gonorrheal and mixed infections. Treatment of the local lesion and urethral mucous membrane is rendered difficult or impossible by the edema and inaccessibility of the infected part.

One of the authors has previously published a procedure for the treatment of such cases[1] by cauterization and circumcision:

Given a case of chancroidal or gonorrheal infection with phimosis or paraphimosis, the field of operation is cleansed thoroughly with tincture of iodine on gauze. All visible ulcerations are then cauterized wide of the ulcerated area by actual cautery, at the same time making sure that the cautery destroys all infected and diseased tissue in the base of the ulcers. A dorsal slit is then performed, the prepuce and glans are cleansed with tincture of iodine on gauze and all ulcerated areas on glans and prepuce are treated by cauterization, and in most cases the dorsal slit incision is lightly cauterized also. Circumcision is immediately done, care being taken if practicable not to cut through a cauterized area, thus leavinig a part of the line of incision to heal by granulation. Should the case be one of gonorrheal phimosis the field of operation is cleansed with tincture of iodine, a dorsal slit is made, the wound lightly cauterized and, after delivery of the glans penis, circumcision is performed. In many cases of gonorrheal phimosis, after dorsal slit, an ulcerative balanoposthitis or chancroidal infection is found. In such cases the treatment is actual cautery and circumcision.

Some of the cases of penile chancroids were complicated by a secondary extreme chancroidal infection of the groin or other parts about the genitalia. In these iodine is applied and thorough cauterization done. In others the chancroidal and secondary infection may be so extensive that circumcision, after cautery, is impossible for the reason that, after thorough cauterization, there is not enough healthy tissue for such procedure. In these cases two or more slits in the foreskin are made, the flaps are drawn away from the glans by tissue forceps or hemostats, the cautery is applied and the entire foreskin is burned off, the wounds healing by granulation. Such a condition was present in two of fifty-four cases. In two other cases untreated phagedenic chancroids had destroyed the entire glans penis. In these amputation was done by the cautery by retraction of the skin and superficial connective

[1] Qualls, *Military Surgeon*, August, 1918.

tissues, burning through these layers and then through the other penile tissues, procuring the urethra with forceps, and fixing it with sutures. The wound heals rapidly by granulation and renders extension of the chancroidal infection improbable. After cauterization or circumcision, thymol iodide, or other antiseptic dusting powder, with dry dressing is applied and the wound dressed in five or six days. If dressed sooner the danger of infection is more probable.

In cases in which primary syphilis is suspected, we have found it advantageous to excise the local lesion where it can be done without mutilation, and cauterize the area of excision. The excised ulcer is sent to the laboratory, where a small amount of clear serum is expressed for dark field examination. In this way a positive diagnosis of syphilis is made in the early stage before Wassermann is positive. In not a few cases in the excised lesion one is able to demonstrate the treponema pallidum with much more ease for the examination and comfort to the patient, than by repeated attempts to express a clear drop of serum and demonstrate it while the chancre is still intact. It is evident by this procedure there can be no pain, and a clear serum is much more easily obtained, hemorrhage being impossible. In addition to the dark field examination after excision and circumcision has been performed, the tissue may be stained by the Levaditi method or used after maceration for the infection of rabbits, for experimental purposes, by injection into the scrotum.

Many cases have been treated by the method described above at the base hospital at this camp with good results.

GENERAL SUMMARY

1. The first question to be decided relative to the problem of venereal diseases as it concerns the Army is, whether it is the proper policy to induct men with venereal diseases into the Army. In so far as our experience is concerned this can be answered in the affirmative, for the following reasons:

(*a*) For its moral effect upon individuals in civil communities, men should not escape military service by purposely contracting venereal disease.

(*b*) A cure can be accomplished within a reasonable length of time, thus giving the Army additional man-power, which would otherwise be lost.

2. Our statistics indicate that from 8 to 10 per cent of white males and from 20 to 40 per cent of colored males are infected with venereal diseases. If the system detailed above, together with systematic civilian control, should have been continued during a long war it would have resulted in the elimination of a great percentage of venereal diseases throughout the nation, thus decreasing a serious economic loss from these diseases and their complications.

3. It is believed that we have demonstrated at Camp Meade that

the proper systems of coöperation and control in the prevention and treatment of venereal diseases are factors without which the handling of a large number of men is impossible. The medical and surgical treatment of an individual case is simple, provided the system is perfected, since at Camp Meade we were able to handle over 3,000 cases daily.

FORM 2

VENEREAL TREATMENT STATION CAMP, CAMP MEADE, MD.

Name.....Rank.....Co.....Org.....Date.....

Diagnosis.....

Number of attacks.....Onset of present attack.....

Discharge.....Urine 1.....Urine 2.....

Prostate and Vesicles.....

Cystoscopy and Endoscopy.....

.....

.....

Wassermann.....

.....

Dark Field Examination.....

Remarks.....

.....

.....

Disposition.....

(Reverse of Form 2)

TREATMENT

Date	Urine 1	Urine 2	Prot	Zinc	Perman	Silver	Instil	Sound	Mass	Syph	Smear	Date	Urine 1	Urine 2	Prot	Zinc	Perman	Silver	Instil	Sound	Mass	Syph	Smear

FORM 3

TO COMMANDING OFFICERS: Kindly keep these attendance sheets in your office. Venereal patients must come accompanied with this sheet.

_____

_____

Each man is to return for treatment on day marked thus: * After his name		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Name	Diag.																														

TREATMENT IN RELATION TO THE MECHANISM OF SHELL-SHOCK

By Captain L. C. FROST
Medical Corps, United States Army

THE TRIUMPHS of surgery and the wonderful work of our military doctors in the field of preventive medicine have been so thoroughly exploited in the contemporary press that both profession and public have become a little dazzled, and disinclined, perhaps, to grope in less brilliant fields where a rigid analysis of results might force the recognition of comparative failure. The history of the neurological field during the first nine months of the war shows us a doubtful region in which court-martial and clinic often usurped each other's jurisdiction, a period marked frequently by tragically irreparable results. The idea that a soldier could be afflicted with hysteria or other psychoneurosis without at least a certain degree of guilt, was not as yet accepted by the average military surgeon, and treatment was usually tinctured with, or even replaced by, punishment. This state of affairs cannot be laid at the door of the neurologists, for at that period theirs was regarded as an almost purely consultant service in the base zone, organized to deal only with cases sent back from the advance zones diagnosed as "crazy." As in every other war activity, experience compelled rapid progress, and the practice of neurology at the front was placed in the hands of men whose keen professional insight and organizing ability built up a specialized service of remarkable efficiency.

This very fact, specialization in the handling of the psychoneuroses, suggests as its corollary that the average medical officer possesses as yet little training along the very special lines which make for success in dealing with this class of cases. This would not be of great importance were the psychoneuroses of only incidental frequency, which would permit segregation for treatment at the hands of specialists. But it will be seen as a vital military problem, when we consider that one out of every five discharges in the British army was on account of a psychoneurosis, as estimated by Sir John Collie, President of the Special Pension Board on Neurasthenics of Great Britain, after careful analysis of 170,000 cases.[1] This means that scores of thousands of these cases must pass through the hands of the average medical officers, and that many must be dealt with by them alone. Reduced to tactical terms, it means that, in at least 10 per cent. of all casualities, the question of

[1] Salmon, Thomas W.: The Care and Treatment of Mental Diseases and War Neuroses ("Shell-Shock") in the British Army. New York, 1917.

return to active duty is wholly dependent upon the neurological efficiency and understanding of the average medical officer who handles these cases in the zone of the advance.

Intelligent consideration of diagnosis and treatment can be attained only through a clear understanding of the cause and mechanism of the war neuroses. I shall endeavor in this paper so to outline their essential features that the protean variety of symptoms, and often apparently inconsistent manifestations of individual cases, will not confuse but will point the way by which diagnosis may be made and immediate treatment undertaken by the medical officer at the front line stations.

In order to avoid irrelevant theorizing in a field still hotly contested by the different schools, I will present a simple classification of shell-shock cases. Many classifications have been proposed, most of them theoretical, and all of them far outstripping our real knowledge of the condition, but for our purposes here I will divide all cases into two groups:

Group A. Shell Concussion.—Cases in which obvious physical lesions exist, or in which, if not obvious, physical lesions may be assumed from well-marked symptoms. Such cases include concussions from shell-bursts, cases showing effects of atmospheric or gaseous compression and decompression, carbon monoxide poisoning and other physical or chemical effects.

Group B. Shell Hysteria. Psychoneurosis, War Shock.—All disorders of an acute nature arising in the course of an active military campaign, which present as their chief feature a neurotic or psychoneurotic symptom-complex, and for which no physical nor chemical cause can be assigned.

It is probable that, in many cases of shell-shock occurring under intense shell-fire, the symptomatology is derived in part from the physical effects of concussion and in part from the psychic shock. In a minority of cases the physical effects constitute the entire trouble, and the case is to be classed in Group A. In a larger number of cases the physical effects are present to a slight extent only and are brought into evidence only because of the abnormal neurotic centering of the attention on somatic symptoms. In these cases the physical symptoms are transitory and are important only because they furnish, not the cause, but the starting point for the crystallization, so to speak, of the nervous symptoms. Such cases should be classed in Group B. It is impossible to make any positive estimate of the relative numerical incidence of cases in these two groups, owing to the widely divergent classifications used by many neurologists of high rank. It is safe, however, to state that the vast majority of all cases fall into Group B; and in this paper it will be

understood that the term "shell-shock," when unqualified, refers to cases of this type.

The pathology of shell concussion (Group A) has been carefully studied, and it is generally accepted that the causes of the lesions are of two types: (1) physical, instantaneous aerial compression and decompression, causing minute gaseous or hemorrhagic emboli in the smallest intracranial vessels; and (2) chemical poisoning, due to the carbon monoxide and other deleterious gases released from exploding shells. As to cause of shell hysteria (Group B), there has been waged a wordy war; out of it all comes one clear fact, supported by unassailable reasoning: all cases in this group are functional neuroses, often specialized in type, but none the less purely psychic in origin. A thorough understanding of the two following statements will clarify and bring into one sharp focus all of the seemingly chaotic manifestations of these cases.

1. The cause of shell hysteria is an unconscious recognition of the impossibility of further existence without profound and instant readjustment to the existing environment.

2. The mechanism of this readjustment is release from an intolerable situation through an instinctive, unconscious, and uncontrollable development of some disability which will compel the man's withdrawal from that situation.

The "unconscious recognition" may be taken to be the fundamental instinct of self-preservation arising to dominate the personality in a powerful protective effort. Just as an old and over-loyal servant might on a critical occasion intervene against the will and positive order of his master and remove him bodily from a threatening danger, so this elemental instinct, deeper than all training, by depriving the soldier of some function necessary to his further participation, compels his withdrawal from an environment dangerous to his life or sanity. And this, without consultation of his conscious will or approval, or even directly counter to this authority. Shell-shock is thus seen to be the result of a conflict between the soldier's primitive subconscious self and his trained and disciplined self, in which conflict the former betrays the latter in the interest of the preservation of both.

Now from the foregoing it will be seen that there must be for every man a certain "point of tolerance," beyond which any situation will become, for him, intolerable, and beyond which this protective mechanism will come into play. This point will, of course, vary widely with a hundred factors, among which the strongest will be primitive vital instinct, general physical and psychical stamina, and will power. One man, of stern training and firm mental and moral balance, will stand up through months of the most terrific strain of trench life; while another,

made of poorer stuff, will develop a self-protective "shell-shock" before he has been under shell-fire at all.

It will now be understood why such emphasis is laid by all investigators upon the quality of a man's previous moral and mental training, for this will largely determine his "critical point" beyond which a break may be anticipated. A neurotic diathesis, no matter how light, is a greater danger to military efficiency than more obvious defects such as flat-foot, and should be so considered by examining boards. There is a minority, more conspicious among the German observers, who would presuppose a physical lesion in all cases of shell-shock. This conception would bring us into the maelstrom of academic discussion—the vexed question of the possibility of functional aberration without material lesion—into which we will not plunge. A sufficient argument to prove the psychic origin of all but the obvious concussion cases will be found in one minute's consideration of the following facts:

1. Hundreds of absolutely typical shell-shock cases have been noted in soldiers who have never been under shell-fire.

2. Shell-shock is extremely rare in prisoners and among the wounded, although they may have been under the heaviest shell-fire for days. For them there is no further need of a psychic initiative to remove them from an intolerable situation: their capture or their wound will force their immediate removal from the danger-zone, and there is no necessity for instinctive self-protection.

To attempt a review of the symptoms of shell-shock is as impossible as it would be unprofitable. Theoretically, any function necessary to performance of a soldier's active duty may be lost, and any symptoms which would preclude such duty may be established. In this instance practice follows theory very closely. The only symptoms which are constant in occurrence are naturally those arising in Group A cases from physical causes. These are, roughly, in order of frequency, (1) loss of consciousness, complete or partial, for a period varying from a few seconds to many hours. This loss of consciousness is often clearly an instinctive emergency protection. (2) Partial or complete amnesia, usually including the moments immediately preceding the concussion, and coterminous with the unconsciousness; (3) headache, usually severe, of occipital and upper cervical location, and worse at night or upon making efforts at concentration of thought; (4) tremors of various grades, and (5) cardio-vascular disturbances, including palpitation, tachycardia, breathlessness, precordial pain, hypostatic blood pressure, and faulty circulation in the extremities, which are often bluish, mottled, cold, and clammy. Deafness from rupture of the tympanum, or from wax driven against it, has often been noted; these conditions must be

sharply differentiated from the functional deafness which is such a frequent symptom in cases of the other group. This differentiation between physical and psychical is extremely important in considering each symptom in any case, for in a majority of cases, purely physical at first, secondary symptoms of purely mental origin have appeared before the case arrives at a base hospital.

The symptoms of cases in Group B—shell hysteria—are as varied as the entire range of body functions. To name a few of the most constant and characteristic, we have, roughly, in order of frequency:

1. Psycho-sensory: Insomnia, vivid terrifying dreams, amnesia, headache, harassing worry and fear, cutaneous paresthesias (hyperesthesia more frequent than anesthesia).

2. Psycho-motor: Mutism, aphonia, paralyses (most frequently paraplegic), speech defects (stammering and stuttering), tics, tremors and choreiform movements.

These symptoms do not arise haphazard, and they are always the definite effect of a definite suggestion in some form. On this complicated question Salmon throws a clear light: "The symptoms exhibited usually bear a more direct relation to the existing psychological situation than they could possibly bear to the localization of a neurological injury. Thus a soldier who bayonets an enemy in the face may develop a hysterical tic of his own facial muscles; . . . hysterical blindness may follow particularly horrible sights; hysterical deafness may appear in those who find the cries of the wounded unbearable; and men detailed on burial parties may develop insomnia." The following examples will serve to illustrate this point very clearly:

Sergeant Smith, aged 36, a veteran noncommissioned officer of the regular army, well disciplined and of well-balanced mentality, went through three months of active campaign at the front with rather more than the usual share of shell-fire, and consequent ghastly sights, sounds and smells of the trench. He was apparently in perfect health physically and mentally, but was feeling the strain, and began to sleep poorly. During a period of front line service, and after three days of almost continuous bombardment in which he perfectly fulfilled his duties, he was splashed on the external aspect of the left thigh by a piece of soft mud from a shell-burst about 50 yards away. He was absolutely uninjured physically by the blow, which did not even bruise the skin, and was unaffected by the concussion. He fell, and on attempting to rise found that his left leg was completely paralyzed, which condition has persisted as a partial paralysis for three months. It is to be remarked that, like other hysterical paralyses, the disability did not conform to the anatomical distribution of the nerves, and was accompanied by non-conforming areas of hyperesthesia.

Private Bernstein, aged 27, in civil life a musician, was with his company in a support trench for two hours, preparatory to taking over an advanced position. There was no shell-fire in the vicinity. Naturally of a nervous temperament, the strain of waiting was too great and he exhibited much agitation. Contrary to orders he started to call out to a comrade and was preemptorily ordered to "Shut

up!" When the command to move was given, this man was found apparently asleep against the side of the trench. When roused—with some difficulty—he could not make a sound. Complete aphonia was present, the command to "shut up" having come at a critical moment, and acting as a potent suggestion. The subsequent history of this case is also of value. Being an intelligent man he was much interested in his case. The surgeon to whom he was immediately referred made the diagnosis of "complete aphonia," and so inscribed the diagnosis tag attached to the patient. The following is the patient's own account of what followed, given some months later, while he was still ignorant of the cause of his disability, which was then complete hysterical deafness.

"I read the tag he (the surgeon) put on me, and it said, 'complete aphonia.' Well, I knew 'telephone,' and 'phonograph,' and all those words with 'phone' in them, and so I knew that it must mean that I had something the matter with my hearing (sic). I could hear all right then, but I knew that sometimes these things don't happen all at once, and I wasn't surprised when a few hours afterwards I got deaf. It said, 'complete,' and sure enough I soon couldn't hear a thing!" He then innocently dilated on the wonderful powers of the surgeon who "foretold" his deafness! The original speech defect had in the meantime spontaneously disappeared. The deafness persisted despite a variety of physical "treatments" until the patient was given a rationalizing "conversazione," the cause and mechanism of his trouble being made clear to him; after which hyponosis with firm counter-suggestions effected a prompt cure in one sitting.

The practical lesson to be learned from these cases, which are chosen from hundreds quite as typical, is that suggestion plays a fundamental rôle in the determination of symptoms. There is, for instance, a marked tendency for the disability to follow some suggestion contemporary with, or subsequent to, the moment of shock, as in the case of Sergeant Smith cited above, where paralysis of the leg followed a slight blow; likewise a persistent cutaneous sensory disorder may often follow a slight burn from a corrosive gas shell. Ignorance of, or indifference to, this fact is very frequently responsible for the genesis or the fixation of symptoms which may transform a simple case capable of return to duty in a few hours, days or weeks, into a chronic hypochondriac neurotic, who sinks only the deeper into his symptoms as time goes on. Measured merely in money, the Government is paying, and will continue to pay, many millions of dollars through failure to recognize and act upon these psychic mechanisms of shell-shock.

There are no difficulties in diagnosis except the differentiation between shell-shock and malingering. This is a real difficulty, and in the early months of the war it was responsible for more than several tragedies in the British service, which must never be repeated in our own. The plain coward and the healthy malingerer must be dealt with by a heavy hand, and by onew hich, because of experience and knowledge, does not vacillate. The shell-shock casualty, on the other hand, even though he may have broken down early in the game and before he had

been subjected to any real danger, is not necessarily a coward nor blamable. It is plain, then, that the medical officer must be ready with skill, knowledge and decision, to make this distinction clear and unfaltering in all possible cases. Whenever there is reasonable doubt, the soldier must receive the benefit of it. If the soldier *is* malingering, and is mistakenly removed to a hospital, he will surely and quickly be found out and returned to duty or to punishment—and little harm has been done. If, on the other hand, a shell-shock patient is sent back to the trenches, court-martialed, or denied the advantage of immediate transfer to hospital care, his case is invariably made worse and tranformed from one which might have been cured and returned to duty in a short time to one involving months or years of treatment and expense to the Government. There are special shell-shock hospitals behind the lines now, where obvious and doubtful cases should be rushed for treatment or for final diagnosis. "Cases of malingering are by no means always easy to diagnose, for there is no sharp dividing line between downright malingering, mere exaggeration, subconscious malingering, and actual disease; each class merges into the next."[2] Chavigny[3] sums it up well when he says:

> But the principles for testing malingerers, even in most suspicious cases, remain always the same: never to trust to the impression of the first moment; to observe carefully, never to reveal any suspicions to the accused or to anyone in the vicinity to review mentally and consider most carefully and completely the diagnosis; then, if proper, to act, and with the utmost assurance, and as an expert backed by documentary evidence incapable of error. The doctor who mistakenly accuses a patient of malingering performs an odious act, and deserves from both the military and medical point of view the severest opprobrium.

While the treatments suggested for shell-shock run the whole gamut from the simple prescription of "fresh air and common sense" to Kaufmann's[4] elaborate and deliberate Prussian "brutality treatment"—"Ueberrumpelung"—there is one point upon which there is absolute unanimity: the treatment, whatever it is, must be instituted at the earliest possible moment. Delay spells disaster. But even so, wrong treatment is worse than no treatment. The mind of a victim of recent shell-shock may well be likened to freshly mixed plaster of Paris. The lightest touch will make an impression either for good or ill, which in a few moments becomes fixed and hardly to be changed. Proper treatment during this first plastic period will effect cures which seem almost miraculous, just as casual adverse suggestions or failures of well-meant but

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[2] Campbell, Harry: War Neuroses. Practitioner, London, xcvi, 501-09, May, 1916.

[3] Chavigny, Paul: Psychiatrie aux armées; thérapeutique et médecine légale." Paris méd., vi, 3-13, Jan. 1, 1916.

[4] Imboden, K.: Das Neurosenproblem im Lichte der Kriegsneurologie. Corr. Blatt für Schweiz. Aerzte. 1093-11-09. References.

ill-advised treatments will crystallize and fix existing disabilities and add thereto many new ones. For the same reasons, fresh cases should never be sent far to the rear or out of the country, for such a course carries with it the suggestion of a long convalescence. This may be necessary later, never early in the course of treatment.

The time elapsing between the onset of shell-shock and the institution of treatment by a qualified neurologist should be as short as possible; at this juncture every hour's delay is likely to mean a day's or even a week's postponement of return to duty. During this time the patient should be made absolutely comfortable, with narcotics if necessary, and he should be especially guarded against chance suggestions and unguarded diagnoses, which, if made at all, should be in a sealed envelope. Whatever disability exists should be carefully explained as an evanescent phenomenon quite usual in these cases, and of no permanence nor importance. Chavigny states[5] that the majority of shell-shock cases are radically cured within forty-eight hours when treated with the requisite promptness and intelligence. This statement seems wildly optimistic when compared with the disheartening prognoses of other workers using time-worn routine neurological treatments. The difference, however, is merely the measure of the possibilities: Chavigny has no secret methods, and his results are reproducible. Prophylaxis is of course the ideal treatment, and the ideal prophylaxis would be, from the military viewpoint at least, the elimination from the Army of all men of the "pre-shell-shock" type. In dealing with the army personnel as it is, all that can be done in prophylaxis is the segregation of men obviously of this type and their employment in situations where the pressure of army life is not likely to rise beyond their critical points of tolerance.

What is the rational treatment of shell-shock? Going back to our classification, the cases of concussion in Group A will need first, rest, quiet and simple hygienic care; and second, protection from the possible psychic disabilities which so often complicate the original concussion symptoms in cases carelessly treated. There is as yet no specific treatment for this class of cases.

For the cases of Group B, treatment must be clearly related to the cause and mechanism of the disorder. Since these are purely mental, it is evident that the treatment must be psychological in character, and that any treatment obviously directed toward the relief of a physical symptom as such will be more likely to afford a basis for the fixation of that symptom. On the contrary, every effort must be used to empha-

[5] Chavigny, Paul: Psychiatrie et médecine légale aux armées. Paris méd., v, 131–189. July 17, 1915.

size the purely functional nature of the symptoms. In the cases of intelligent patients, a clear explanation of the mechanism of their troubles, and an effort to effect a thorough mental catharsis for the relief of any latent pressure of unexpressed emotion, will accomplish a rapid cure in the great majority of cases. With unintelligent patients quicker results are obtained through hypnotism and counter-suggestion. Capt. W. Brown, R. A. M. C., considers,[6] from a study of over 4,000 cases in England, France and Egypt, that this "working-off" or release of the emotion caused and repressed by the shock is an essential to the treatment of shell-hysteria. He calls this process "abreaction." The explanation to the patient of the mechanism of the trouble and the clarifying process are, in his mind, together happily termed "autognosis." Captain Myers states that "in all these cases whenever the memories dissociated from the normal personality are revived, they are accompanied by an outburst of emotion . . . generally of fear." Now, it is accepted generally that normally every stimulus, mental or physical, must produce a reaction, adequate and expressed. During stress of battle, and especially during high explosive bombardment, the stimuli are so intense that adequate reaction is impossible; and the normal reaction, fear, must be completely repressed. Under such conditions of internal pressure from unexpressed reactions, a sudden overload "blows the fuse," and the fear is released to find expression as it may, either as fear or other emotional equivalents or sublimations. In all cases the whole attitude of physician and attendants must be one of perfect confidence, a confidence not forced, but obviously a result of success.

The foregoing principles apply to treatment in general of all the varied manifestations of shell-shock. It is in the special forms of the neurosis that the utmost ingenuity of the physician is called for. In dealing with the motor inhibitions of speech, mutism, aphonia, stammering and stuttering, each case demands a means determined by its own peculiarities. Hypnosis is acknowledged by all authorities to be the most useful and most brilliant method of attaining results in all of these cases. The few who have failed in its use are those who are comparatively unfamiliar with it. Those who have used it most have had results quite comparable with those of Eder, R. A. M. C., Psychoneurological Department at Malta. He reports[8] one hundred consecutive cases of shell-shock of Group B, the ordinary psychoneurotic type,

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[6] Brown, W.: Treatment of cases of shell-shock in advanced neurologic centers. *Lancet*, Lond., Aug. 17, 1918, 197.

[8] Eder, M. D.: War-Shock; The Psychoneuroses in War; Psychology and Treatment. London, Heinemann, 1917, 151 p.

treated by hypnotic suggestion; no case so treated was not improved, and 91.5 per cent were cured. One of the most satisfactory points in favor of this method is the rapidity of the cure. The patient is from the first able to see results, and this in itself is a powerful adjuvant. Myers, in summarizing the results of hypnotic treatment in 23 unselected cases of shell-shock, reports:[9] "Apparently complete cure, 26 per cent; distinct improvement, 26 per cent; no improvement, 13 per cent; failure to accomplish hypnosis, 35 per cent. Considering only those cases in which hypnosis was actually used, this would show about 37 per cent of complete cures and 37 per cent of cases distinctly improved. In two series of 1,000 cases each of shell-shock disability, among which there were altogether 121 cases of mutism and a smaller number of deaf-mutism, Capt. W. Brown, R. A. M. C., treated 173 in the first series and 132 in the second series by hypnotic suggestion, and succeeded in curing every such case.[6]

In many cases of motor inhibition it is advisable to add to any other means of treatment the application of some strong, sudden and unfamiliar stimulus, causing reflex action before the abnormal inhibition can prevent it. Several cases of mutism and aphonia were cured in ten minutes by the following means. The patient's attention was directed to his bared epigastrium, being told that he was to be cured by electric stimulation of the solar plexus. A mild faradic current was then applied to the epigastrium. He was then told, quickly but casually, to "say when it's enough," and simultaneously the strength of the current was increased rapidly to a marked degree. Without hesitation the patient cried out, "Now!" Rarely was a second sitting necessary, such cases being fully cured when once they realize that they *can* speak. Sometimes reëducation of the speech faculty is necessary or advisable, beginning with the production of the elementary sounds before a mirror. This is usually necessary only in mistreated or long untreated cases.

The prognosis in shell-shock of all types is, from the point of view of the individual, good. The chances are that as soon as he is returned to civil life where the strains of normal life are usually well on the safe side of his individual "point of tolerance," he will resume normal functioning. An analysis of over 700 cases discharged from one of the special shell-shock hospitals in England shows that 65 per cent of those returned to civil life were subsequently reported as doing satisfactorily. From the military viewpoint, prognosis is not so good. Many author-

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[9] Myers, Chas. S.: Contribution to the study of shell-shock; (II) Being an account of certain cases treated by hypnosis. Jour. Roy. Army Med. Corps., xxvi, 642-655, May, 1916. Also *Lancet*, Lond., Jan. 8, 1916, 65-69.

ities have expressed the opinion that very few men who have suffered from shell-shock can make good again in trench life.[10]

From the foregoing it will be understood why the treatment of shell-shock by the average medical officer trained only in general medicine and surgery, is successful in relatively few cases. And inasmuch as no shell-shock case remains *in statu quo*, those which are sometimes negatively classed as "unimproved" are in truth positively retarded, the damaging suggestion of failure making for delay in recovery. The conclusion to which we are forced, and the vital point to which this paper is directed, is that every advanced aid station should have a medical officer specially qualified for the care of psychoneuroses; and that his treatment must be prompt and must have as its basis the psychological mechanism underlying the condition.

SUMMARY

1. The group of disabilities termed "shell-shock" is one of the more important factors determining the non-effective rate in active campaign.

2. In a small fraction of shell-shock cases the causes are physical, *e. g.*, cerebrospinal concussion causing multiple minute hemorrhages; instantaneous cerebral compression and decompression; poisoning by explosion-gases; asphyxiation by burial. All cases except these are purely psychic in origin.

3. The psychic mechanism of shell-shock is an incontrollable instinctive defense reaction having as its subconscious end the removal of the subject from an intolerable situation. The means subconsciously adopted to this end are (1) loss of some function necessary to active military service, or (2) production of some symptom incompatible with active military service.

4. The symptoms of psychic shell-shock are determined by endogenous or heterogeneous suggestions, and in the fresh case they are produced, fixed, or removed, with equal ease, by the same means.

5. Treatment should be governed by the following rules: (1) it should be given only by medical officers specially trained in this work, one of whom should be stationed at each advanced aid station; (2) it should be instituted at the earliest possible moment; (3) it should be directed away from physical symptoms and toward psychic readjustment, (4) and most important, it must be carried on in constant conscious relation to the cause and mechanism of the condition as exemplified in the individual case.

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[10] The writer believes that under more rational and prompt methods of treatment this opinion could be safely modified to a considerable degree.

AERO AMBULANCE

By Major S. M. STRONG
Medical Corps, United States Army

(With four illustrations)

I HAD not been attached to the Air Service many weeks when I appreciated the value of transporting patients by aircraft. The following is a description of my design of aero ambulance in use at Eberts Field, Lonoke, Ark., for several months; it has proven highly efficient and satisfactory and has elicited favorable comment from many officers with requests for a detailed description. The accompanying photographs show every detail in loading. The ambulance is simple in construction, a remodeled Curtis biplane type J. N. 4 D, and it can be loaded in the same length of time ordinarily consumed in placing a single patient in our present type of automobile ambulance.

The following changes and additions were made in the ships:

From the rear cockpit there were removed the seat, instrument board, gas throttle, switch, stick, and rudder bar and the following additions were made:

(*a*) Metal cross piece fusellage bottom to support the foot of the litter.

(*b*) Two rests, one on either side of the ship, to support the center litter bars.

(*c*) Two straps at the top of the cockpit in the rear, one on either side, to make the head of the litter fast.

(*d*) Platform on top of fusellage at rear of cockpit.

(*e*) Straps across the back of the ship to hold down the metal section of the turtle back.

(*f*) A step on either side of the fusellage.

The ship was remodeled as follows:

(*a*) Floor boards were placed in rear of cockpit.

(*b*) Two metal pipe fusellage braces were substituted for the original wood braces.

(*c*) The cockpit metal covering was lengthened 24 inches.

The litter is made of pipe about 6 feet in length, shaped so as to give two separate leg pieces, which may act as splints if necessary. The litter is covered with canvas, laced on, making it easy to remove, with broad canvas straps, so placed as to cross the chest of the patient or support an injured arm. One strap is attached for each leg. The head is placed on a shaped head-rest which

is adjustable, moving up and down on the frame to fit tall or short patients.

To load the ambulance, the metal section of the turtle back is removed; the litter is removed and loaded. The litter with patient is now lifted and placed upon the platform on the top of the fusellage. One litter-bearer now goes to the other side of the ship and both men, now standing upon the step at the side of the ship, gently lift and slide the litter into its proper position in the cockpit, the foot of the litter passing under a safety hook on either side. The usual life-belt is tightened across the abdomen of the patient. The head of the litter is tied by two straps to the metal pipe of the fusellage brace and the metal turtle back is replaced and strapped. Loading is then complete, the operation requiring only three minutes. The patient's head rests back across the shaped cushion fastened on the litter and protects his head from rolling. The jar of the landing is absorbed by the spring of the metal frame of the litter and canvas and is practically without sensation of a jar. Test rides have proven that loading and transportation are very comfortable.

Equipment.—Emergency equipment is carried in a square canvas pack (similar to the present Hospital Corps pouch), with a strap so that it can be slung over the shoulder. The pack is suspended at the back of the front seat in the rear cockpit. A fire extinguisher and wrecking tools are also on board.

When traveling to the scene of a wreck, the medical officer is seated in the rear cockpit and, being supported by a leather cushion, this permits him to be in a very comfortable position and enables him to act as an observer to assist in locating the wreck.

The ship is well balanced, the load being distributed in the rear cockpit so near the normal load bearing points as not to make the ship tail-heavy, and requiring but few adjustments.

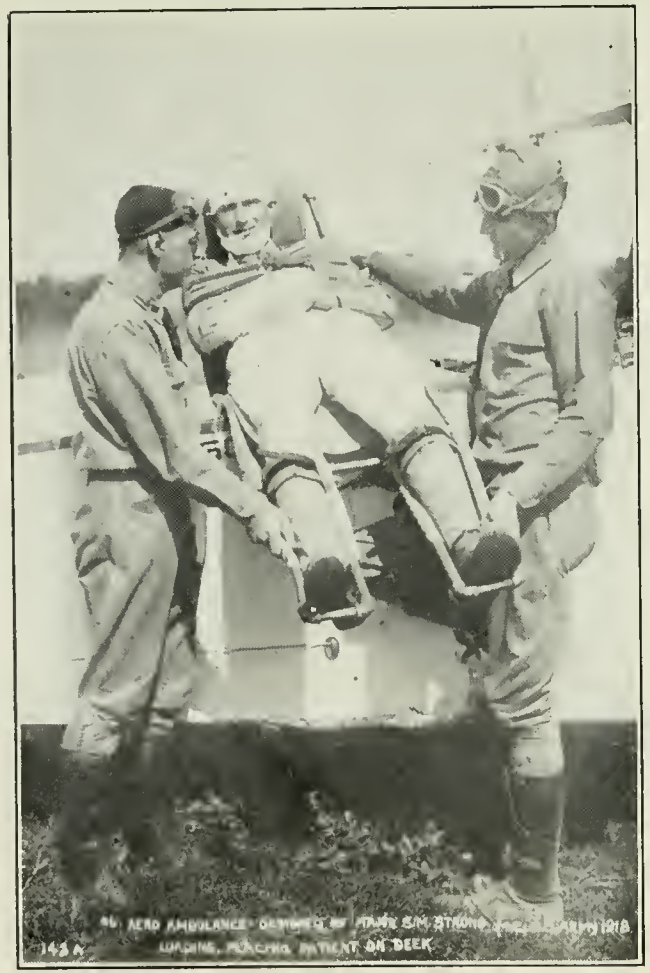

Fig. 1.

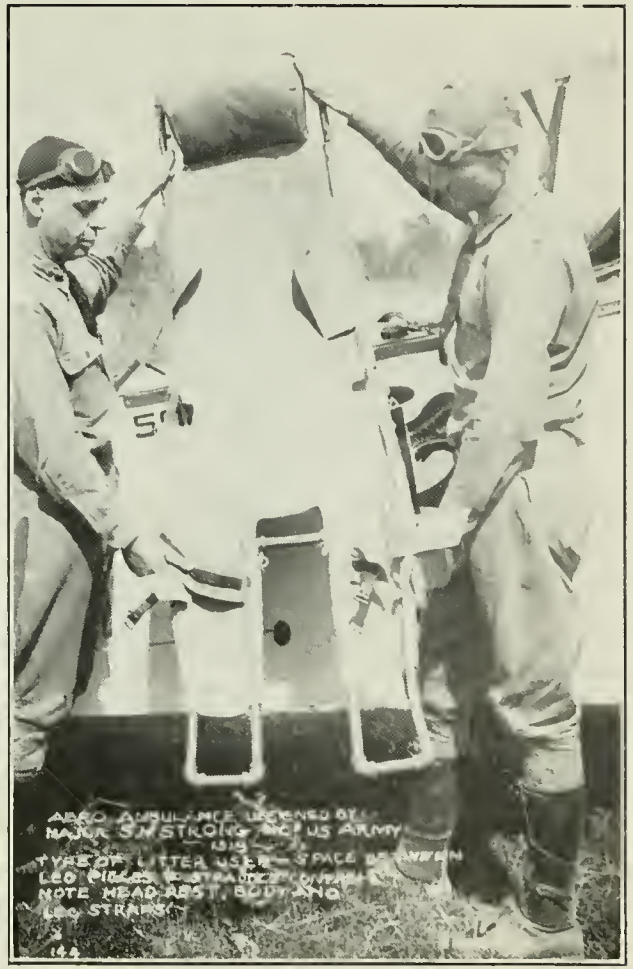

Fig. 2.

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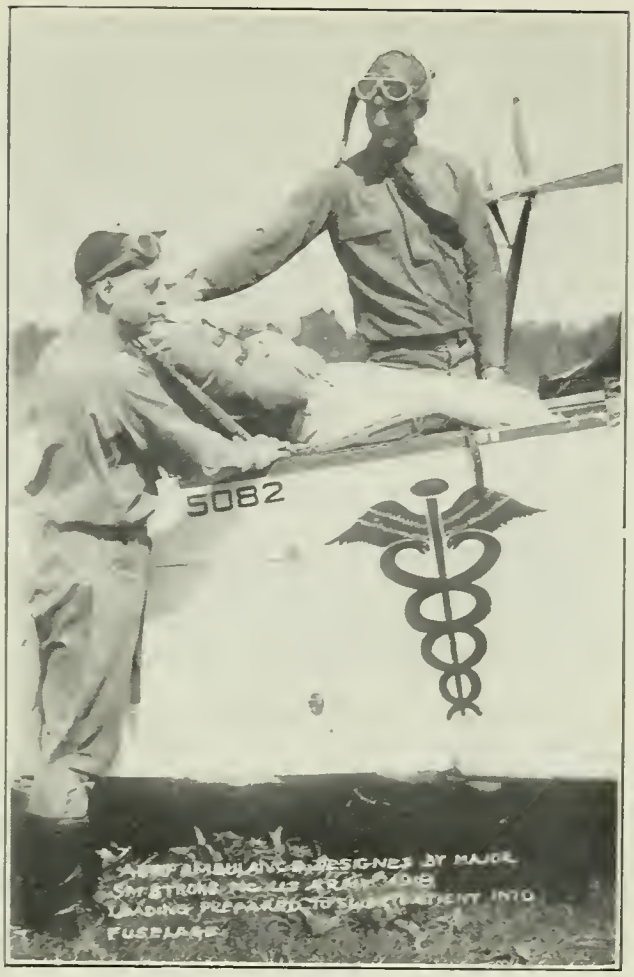

Fig. 3.

Fig. 4.

THE SQUAD ROOM BARRACKS OR THE UNIT BARRACKS?

By Col. CHARLES LYNCH and Lieut. Col. JAMES G. CUMMING

Medical Corps, United States Army

(With four illustrations)

DURING the period of acute infectious disease prevalence, the rapid entrance and exit of troops at a port of embarkation became critical because of the accumulation, at times, of disease contacts.

The present-day construction of barracks is such that there are from 30 to 80 contacts on each barrack floor for every case of communicable disease. Contacts of the virus diseases—measles, scarlet fever, etc.—must be held in quarantine for the full incubation period. Consequently, at any port where there are considerable troop movements, there is an accumulation of contacts far out of proportion to the normal population of the port camps. This accumulation is not of great moment at the interior camps where troops are stationary, for at such camps there are contacts of only a single division. Such contacts can be returned to their organization at the termination of the quarantine period. There exists, however, a different situation at a port of embarkation through which thousands of troops of an indefinite number of organizations pass.

At these port camps organizations arrive and depart in rapid succession. The railroad journey from the interior to such a port is fraught with increased opportunity for the distribution of infectious diseases. This is due to crowded conditions and difficult messing facilities, resulting at the termination of the journey in an increased number of communicable disease patients and contacts. Upon arrival at the port troops are held in camp quarantine. But the short period of quarantine for troops in transfer makes it impossible to return contacts to their organization prior to embarkation. Troop movements of, say, 60,000 per month through a port of embarkation filter out contacts in large numbers. These men cannot be returned to their organizations, but upon release are transferred to casual organizations. Because of the excessive loss in man-power and the difficulties entailed in reclassifying these men in casual organizations, an attempt was made to determine how the number of contacts for each case might be materially diminished.

This could only be accomplished by a change in building construction, which would entail a division of each barrack floor (in accordance with Fig. 1) into four squad rooms for eight men each.

The plans and estimates were submitted in August, 1918, and late in October these were approved and the necessary expenditures were authorized. In the interim, however, our views as to the mode of transmission of the so-called respiratory diseases met with a reversal; as a result it was believed that this, in conjunction with the signing of the armistice, did not warrant the proposed expenditures.

It is true that the division of the barracks into squad rooms would accomplish much if the diseases to which the soldier is prone are entirely air-borne. The number of contacts would be diminished one-fourth. There would be a 75 per cent saving in manpower. There would be less disorganization of embarking troops and the casual camp would be reduced three-fourths. But these points are only secondary to the main object in the actual control of disease—that of cutting down the number of cases of infection to an irreducible minimum.

From our studies during the spring and summer of 1918 we were led to consider the quarantining of all men on the barrack floor (as contacts of a case) as a doubtful procedure, and not of great value as a control measure, because, by companies, the percentages of secondary cases among those quarantined and among those quartered on the other floor in the same building and in adjoining buildings occupied by the same company did not materially differ. We later found that in general the same held true for tent camps. Furthermore, it is to be pointed out that when troops are quarantined—let us say thirty-two men on a barrack floor—that these men are exposed one to another, not only during the sleeping hours, but for the full twenty-four hours of the day. Under these conditions contact transmission is increased many times, and, as the association is more intimate under these quarantine conditions, the possibility of transmission is increased rather than decreased. Individual isolation is the ideal to be attained and would eliminate this increased intimacy among contacts. This is, however, impossible of accomplishment. The same end can be gained within practical limits by doing away with the quarantining of contacts and depending only on careful daily inspections of the entire command for the control of virus diseases. It is not the identification of a secondary case in a group of contacts, but the identification of the mild un-

recognized cases by daily inspection of the entire command which is to be sought, and this inspection is, in the end, the most practical procedure of control.

Our gradual reversal of views as to the routes of transmission of so-called air-borne or respiratory diseases from the theory of air-borne, droplet, or direct contact infection, to that of sputum-borne or indirect contact transmission through inanimate objects and eating utensils, has convinced us that the division of barracks is far less important as a control measure than blocking the transmission by hand cleanliness and blocking it at the eating place common to all members of the organization.

The occurrence of secondary cases of sputum-borne infections—measles, influenza, pneumonia, etc.—is not limited to the occupants of the barracks floor, but we find that the spread to secondary cases is throughout the entire organization without special reference to those occupying a barrack floor.

It was our intention to make a more complete study of the relation of secondary to primary cases during the prevalence of sputum-borne diseases this winter, and the occurrence of the influenza epidemic presented the most favorable conditions for such a study.

From our reported investigations of the influenza epidemic, which covered a study of over 66,000 troops, and other reports on measles and streptococcus pneumonia, we make the following salient points as to the transmission of the sputum-borne diseases:[1]

There are major and minor routes of transmission of the sputum-borne diseases. The *major* route of distribution among troops has been through mess kit wash water, and primarily by hand to mouth infection. By this avenue the mess gear and the hands of the unrecognized case, the carrier, or convalescent, carries the infective agent from the mouth to the mess kit wash water. From this wash water the infection radiates by the contamination of mess gear and hands, and thence to the mouths of non-immunes in the same messing organization. The character of the shelter, the air space within those limits required by Army Regulations, the kind of duty performed, the clothing, the quarantine and the many other conditions under which troops live, played little or no part in the prevalence of influenza so far as our rather extensive studies are concerned.

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[1] Lynch and Cumming: "The Rôle of the Hand in the Distribution of Influenza Virus and Secondary Invaders," MILITARY SURGEON, December, 1918.

Cumming, Spruit, Lynch: "The Pneumonias: Streptococcus and Pneumococcus Groups," J. A. M. A., April 13, 1918.

Cumming, Spruit, Aten: "Streptococcus Pneumonia." (In press.)

Companies, battalions, and even regiments, as we have observed, may live under identical conditions as to shelter, etc., and yet the incidence of this infection may be 80 per cent greater in one unit than the other, and, as we have observed, mess-hall management—the providing of *boiling* water for mess kit washing—is the only difference in the two units. When boiling water is provided infective organisms are destroyed, thus preventing the contamination of mess gears and hands of non-immunes.

Furthermore, we have been led to believe from our recent investigations of the influenza incidence among 20,000 employes at department stores, hotels, and restaurants that the sterilization of eating utensils by machine washing is a large factor as a control measure in sputum-borne infections.[2] These employes were grouped as to whether they ate from machine or hand-washed dishes. In the latter group there occurred 86 per cent of the total cases of the two groups. Is there a more frequent point of contact between the mouths of many individuals than eating utensils; moreover, is there any fluid affecting the human mouth more highly contaminated with specific disease-producing bacteria, than common dish water?

The bacterial count 25,000,000 organisms per cubic centimeter in dish water, the isolation of the hemolytic streptococcus and the pneumococcus type II from eating utensils before and after they are washed, as well as from the wash water, make plain the facility with which sputum-borne infections may be distributed at a common mess, and emphasize, as a control measure, the disinfection by scalding of eating utensils in camps as well as in civil life. We speak of crowd diseases, but is it crowding together in sleeping quarters and for commercial exchange and entertainment, or for messing, which provides the most prolific means of distributing infection?

Minor routes of transmission of the sputum-borne infections would seem to be from the mouth of the infected through the hand to inanimate objects which are handled by many persons. If these objects are handled frequently and at short intervals the possibility of transmission is greatly increased, because germ-laden saliva placed thereon by an infected individual is more readily transferred to the hands of others—non-immunes—while it is still in a moist state. The possibility of transmission then depends upon the rapidity with which the moist sputum is transferred from the freshly

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2 Lynch and Cumming: "Distribution of Influenza by Indirect Contact—Hands and Eating Utensils." *Amer. Journal Public Health*, January, 1919.

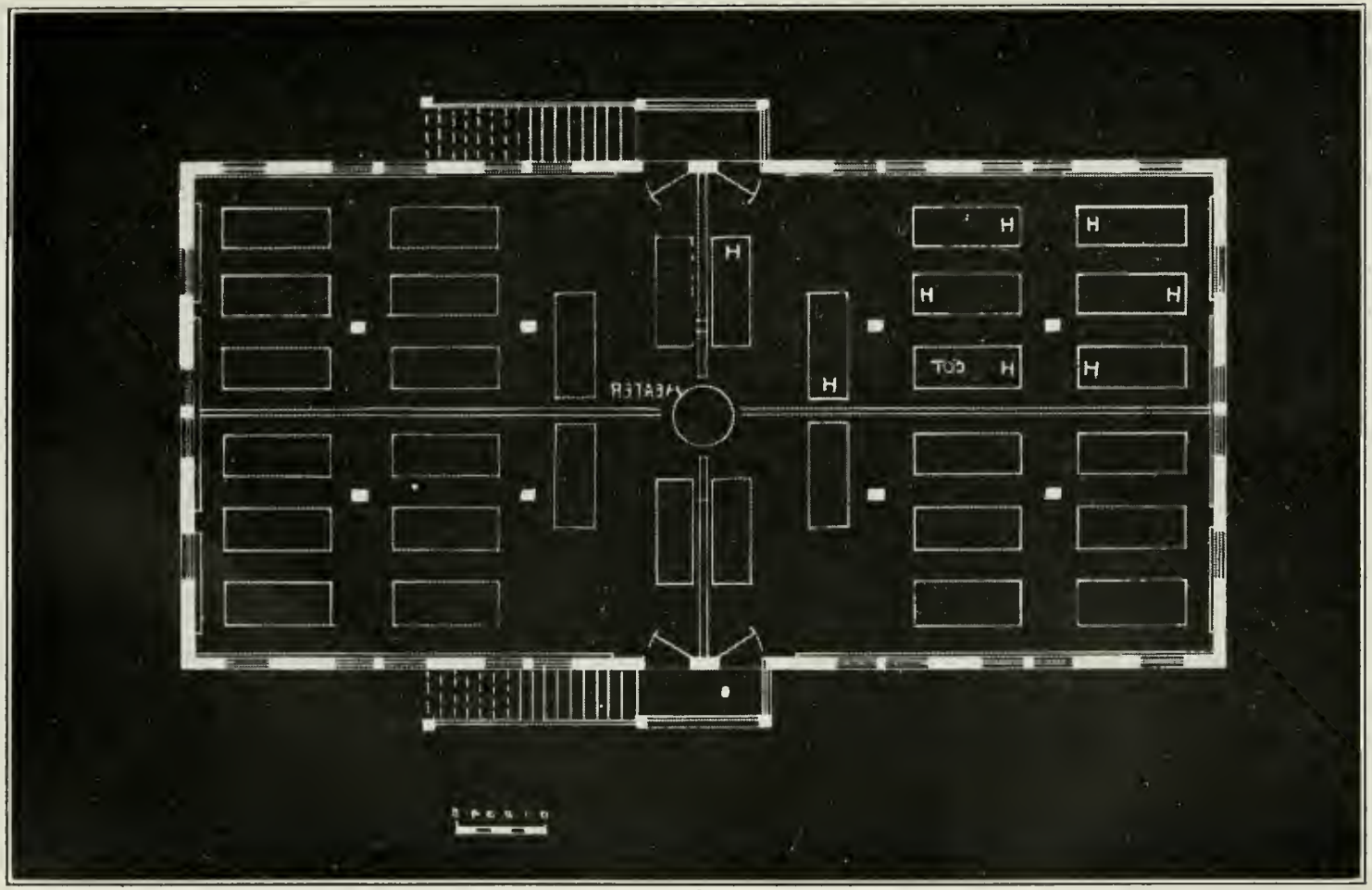

Fig. 1. —Squad Room Barracks Plan.

(To face page 366)

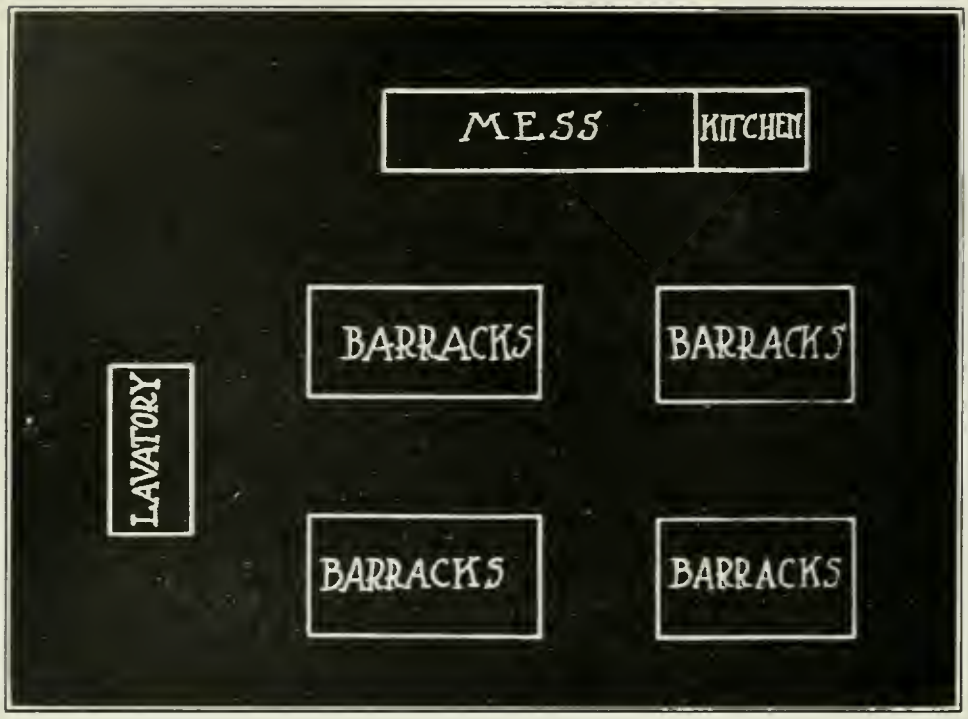

FIG. 2.—PRESENT CANTONMENT PLAN
Six units, four barracks, lavatory and mess-kitchen.

FIG. 3.—PRESENT TENT CAMP PLAN.
Three units, mess-kitchen and lavatory, widely separated.

FIG. 4.—PROPOSED TENT CAMP PLAN.
Three units, mess-kitchen and lavatory, under one roof.

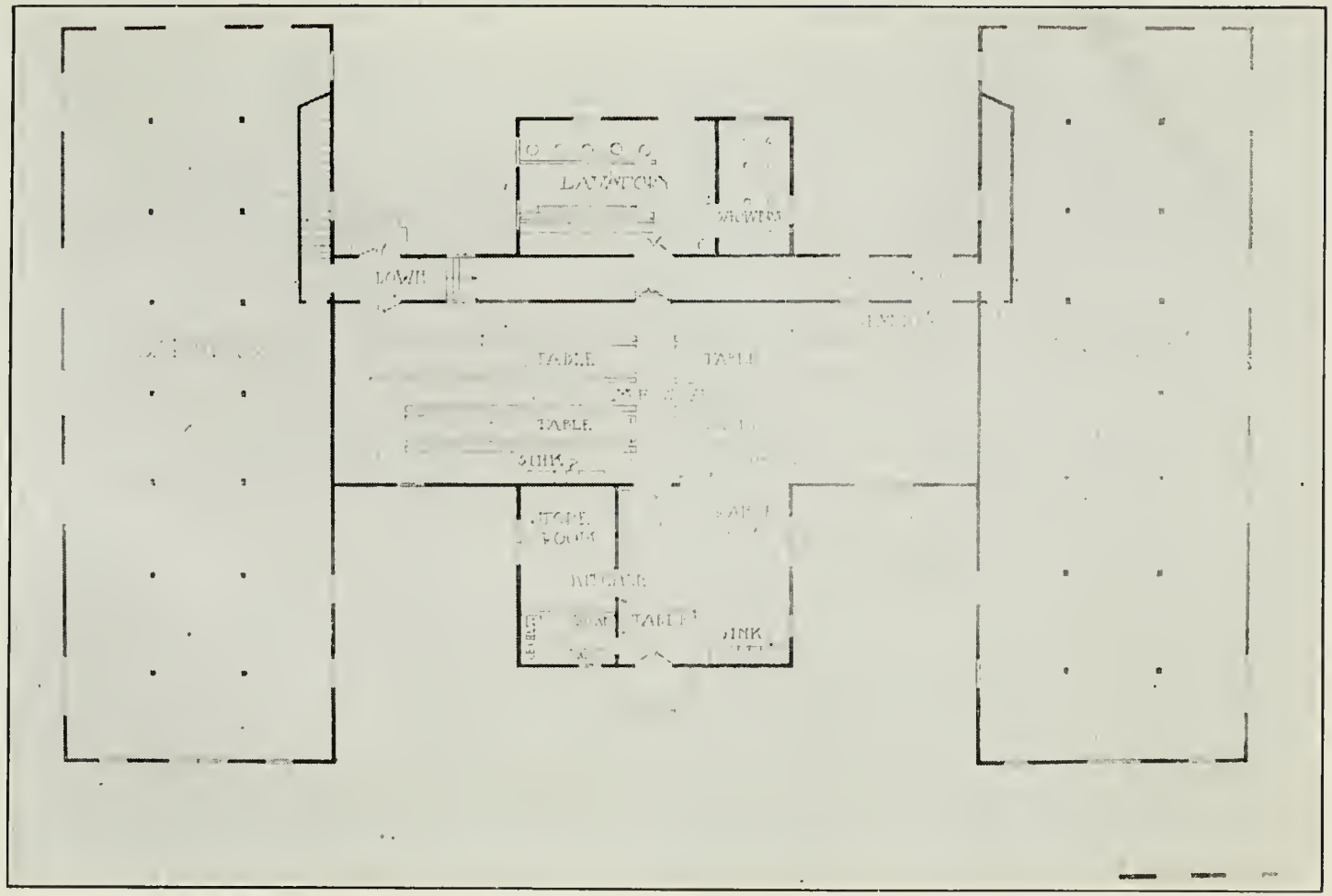

FIG. 5.—PROPOSED SINGLE UNIT BARRACKS PLAN.
Barracks, mess-hall, kitchen and lavatory under one roof.

contaminated hand of the infected to the inanimate object, hence to the non-immune; this naturally depends upon the frequency of touch by a large or small group of individuals. As in messing the contagion is limited to the messing group, so in the handling of inanimate objects the spread of the contagion should be limited to the group coming in contact with the contaminated object. Another group breathing the same air, sleeping in the same rooms, or working in close proximity, will escape the infection so long as they do not handle the primary or secondary contaminated objects common to the infected group.

The mild unrecognized case of influenza or measles in the case of a street car conductor may be the source of wide spread dissemination of the infection, because of the common habit of moistening the thumb or finger as each transfer is issued. The hands of those receiving the transfers become contaminated and this contamination is introduced into the mouth by the soiled hand. The smothering of the cough with the uncovered hand is a practice resulting in hand contamination and the sputum smearing of inanimate objects.

The average soldier, as well as the civilian, washes his hands too infrequently; furthermore, his hands visit his face—and particularly the mouth—with great frequency. We would not intentionally exchange sputum with a case of plague, and we would institute every possible precaution to prevent hand contamination with plague bacilli. But in army as well as in civil life, we disregard the perpetual exchange of sputum, either because we do not recognize the possibility or because it is regarded as natural to our daily life.

It is believed that by frequent washing of the hands with soap practically all infectious material can be removed, or reduced to a non-infectious minimum. From studies recently made by us it appears that transmission by the air route—droplet infection—is subsidiary to the major and minor routes by indirect contact. On this basis—that indirect contact is responsible for the major part of transmission of the sputum-borne diseases—it is obvious that the division of barracks into squad rooms, and the present cantonment construction do not meet the most desirable requirement from the communicable disease standpoint. On the contrary, mess-hall management and construction and lavatory facilities rank foremost in the control of sputum-borne diseases.

In the present cantonments (see Fig. 2) the soldier sleeps under one roof, he eats under another, and attends to his toilet under a third. It would seem that we have not yet progressed from the old

idea of placing the latrine as far from the mess-hall and sleeping quarters as is possible. This is most inconvenient during the day as well as during the night, and tends to a condition of unclean body and hands. Such an arrangement is no longer necessary, for the sanitary toilets of the present camps with their sewage system can be kept as sanitary in the cantonment as in the civilian home, or as in the constantly supervised public toilets in first-class department stores or in well-managed railroad stations.

By inspection, supervision, and screening of camp lavatories, the former menace of the old-type latrine no longer exists. This being so, in addition to recent studies, which tend to show that sputum-borne infections are transmitted largely by the hand, it is apparent that cantonment construction, as well as tent camp construction, can be made to play a large factor in the control of communicable diseases. The construction should be such as to encourage body, and especially hand, cleanliness. The facilities for hand washing must be convenient and handy. This is not so with the present standard construction of separate mess hall, lavatory and barracks, or tents as shown in Figs. 2 and 3.

Recent observations of 8,000 men for a period of three days show that of men in well-trained organizations, with a high degree of *esprit de corps*, although all the men washed upon arising, less than 25 per cent of the men washed their hands before meals. In a camp consisting of 3,000 men whose training was below par, observations for a period of three days showed only 92 per cent of the men washed their hands even once during the course of the entire day.

If we are to have clean soldiers, the facilities which are supplied for cleansing must not only be convenient, but the cleanliness of the men must be supervised by noncommissioned officers specially detailed for that purpose. Furthermore, the recruit must be trained in the early period of his service, for once he acquires unsanitary habits these are changed with the greatest difficulty.

In view of the importance of hand transmission in the spread of sputum-borne diseases, and the necessity for convenient hand-washing facilities in close proximity to the mess hall, it is believed that the plans of construction as shown in Figs. 4 and 5 will accomplish the desired end.

In the old plan of tent camp construction (Fig. 3) the lavatory is placed at the opposite end of the company street from the mess hall. With modern toilet equipment and sewage facilities the logical location of the lavatory is under the same roof with the kitchen and mess hall.

This unit barracks plan (Fig. 5) fulfils the idea of unity in that the kitchen, mess hall, lavatory and barracks are under one roof. The close proximity of the lavatory to the mess hall and barracks makes for general cleanliness, and by supervision at the entrance to the mess hall, soldiers can be made to comply with Army Regulations, Paragraph 286, relative to the washing of hands.

This arrangement will induce at least three daily washings of the hands and should tend to form habits resulting in a higher standard of cleanliness.

These plans not only make for more economical construction, but the arrangement, owing to the convenient location of the lavatory, encourages, rather than discourages, cleanliness.

PREVENTION OF TRENCH FEVER AMONG HOSPITAL PERSONNEL. SUCCESSFUL METHOD APPLIED IN A BASE HOSPITAL IN FRANCE[1]

IN JUNE, 1917, British General Hospital No. 1, situated in Etretat, was taken over by U. S. Base Hospital No. 2 (the Presbyterian Hospital Unit from New York). The unit consisted of 26 officers, 75 nurses and 146 noncommissioned officers and men. The enlisted strength was increased to 200 in October and after that varied between 180 and 200. The unit was in France only three days before taking over the hospital, and, presumably, no member of the personnel had been previously exposed to trench fever.

The unit took over a hospital of approximately 1,000 beds, situated in the casino and summer hotels of the town. During the greater part of the summer the majority of the admissions were medical, a very large proportion of these being cases of trench fever. Delousing measures were aimed only to prevent the discharge of infested men to convalescent camps or duty. No serious attempt was made to protect the personnel from infestation or to disinfect the patients at the time of admission. Bathing and disinfection of clothes, with the occasional application of mercurial ointment, were the only precautions taken.

In the light of our present knowledge of the means of transmission of trench fever, the result was obvious. In October, 1917, Lieutenant Mueller made a report on the relation of louse infestation to trench fever in the unit. Of the 146 men in the unit, 41 had found lice on their persons, and of these 14, or 36 per cent, had had trench fever. Four of the remaining 105, who had no definite knowledge of infestation, had also contracted the disease.

The unnecessary wastage of man power had, by this time, become too apparent to escape notice. The first preventive measure was an attempt to delouse all patients on admission. Every patient was inspected by his medical officer on his first rounds, and those who showed lice or nits were shaved and treated with blue ointment. A second study made in January, 1918, by Captain Pappenheimer revealed no appreciable diminution of the trench fever morbidity and louse infestation among the personnel, although the patients and the wards had been rendered comparatively louse-free. A careful analysis of his figures showed that trench fever and louse infestation did not come from direct contact with lousy patients,

[1] From the Medical Department of No. 1 General Hospital, B.E.F. (U. S. Base Hospital No. 2 Presbyterian Hospital, New York Unit).

but from the handling of infested clothing. No medical officer and only 2 out of 100 nurses had contracted the disease. The incidence was confined almost entirely to the men who worked in the disinfecting plant and the soiled linen room, and to the orderlies who handled the clothing of patients on admission.

The next step—the provision of louse-proof bags for the reception of the clothes—was foredoomed to failure because the clothes, although often able to crawl, could not be persuaded to enter the bags alone. By April the opinion was unanimous that no half-measures could be taken, and we determined to make the hospital louse-proof.

After careful consideration the following routine was adopted:

1. All patients were inspected before they were put to bed and all those found to have lice or nits were shaved before they were bathed. In the case of the walking patients, one officer was detailed from each division to inspect them. One or more orderlies were detailed to each officer to shave the men before they were allowed to go to the baths. Stretcher cases were placed on a clean blanket on top of the uncovered bed and inspected by the ward-master or the ward officer. Infested men were shaved and bathed on this blanket and the blanket sent with their clothes to the disinfector.

2. All patients were inspected once a week by the medical officer in charge of the ward, and infested men were shaved. Reports of these inspections, with the number of patients that required shaving, were sent to the divisional offices. This afforded a means to check the efficacy of the admission inspections.

3. As an additional check, all patients were inspected by the divisional officer before discharge.

4. All orderlies and men working in the pack-stores, baths or disinfecting plant were required to wear louse-proof suits from the time of admission of a convoy until all patients had been disinfested and all clothing disinfected. After each convoy the ward-master of each ward was required to report to his divisional office any orderly on his ward who had found lice on his person or clothing.

The special suits consisted of two gray flannel pajama or fatigue suits, sewed one inside the other and sprayed with creosote oil[2] by

[2] "Creosote oil" is the fraction of coal-tar which distills above 230° C. It contains varying quantities of naphthalene, anthracene, phenol and cresol, held in solution by various less sharply characterized oils. The phenol and cresol are present in amounts of not over 1 or 2 per cent and may be entirely absent. An oil from which they have been abstracted chemically will answer the purpose perfectly well. It is available in France under the name of "carbonyl" at a cost of about $1 a gallon retail.

means of a force pump of the type ordinarily used for spraying formaldehyde. They were worn by the men in place of the uniform, but with ordinary underclothes.[3]

The actual spraying of the suits is accomplished very rapidly. A noncommissioned officer and three or four men spray the seventy suits in use here in about half an hour. The suits are spread on the ground around the pump. The latter is equipped with a rubber connection about 6 feet long, so that about twenty garments are within reach of the nozzle. These are quickly sprayed on both sides. The suits are placed in special wooden boxes on each ward and in the pack-stores. At first they were sprayed before every convoy, but this was found unnecessary because the "creosote oil" is not very volatile, and the period of time has been lengthened.

The men are not at all averse to wearing the suits which, while they have a definite tarry odor, are not unpleasant. When worn with underwear and not too heavily sprayed, there is no cutaneous irritation whatever.

This combination of methods aimed, first, to render the patients louse-free before they entered the beds and thus to prevent the infestation of bedding and hospital clothes; second, to give the most complete protection possible to those men who had to handle infested clothing and perform the work of disinfestation.

Such a system seems, at first sight, rather arduous and complicated. Certainly it would have been impossible to institute it until the unit as a whole had been thoroughly educated in the dangers of louse infestation. In its final development it was found to work easily and automatically. There was a tendency to carelessness in the observance of the routine inspections that demanded constant watchfulness on the part of the divisional officers. But such carelessness was easy to check because it showed up at once in the reports of reinspections.

The only insurmountable difficulty was encountered in the handling of the very severely wounded and pneumonia cases. It was impossible to subject them to delousing measures at the moment of admission. When convoys were admitted at night it was found necessary to furnish drop lights with reflectors for the medical officers who inspected walking cases, because a bright illumination is required for the detection of nits.

Doubtless men not only entered the hospital but were discharged

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[3] Lieut. J. H. Mueller, S.C., described this method of louse-proofing clothing before the Red Cross Medical Research Conference in Paris in January, 1918.

from it infested with lice. This must have happened in spite of the best system. But the result from the standpoint of the protection of the personnel and the prevention of trench fever was better than we had believed possible.

Table I shows the number of cases of trench fever and probable trench fever that developed among noncommissioned officers and men each month.

TABLE I

Number of cases	1917							1918									
	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
Trench fever or probable trench fever occurring among personnel of hospital	2	1	3*	10	5†	3	4	1	3	2	3	0	1	0	0	0	2
Trench fever or probable trench fever admitted to hospital	No statistics				192	283	161	120	126	170	102	122	382	102	179	43	138

* Although the Presbyterian Unit nominally took over the hospital in June, the actual work was only assumed gradually. This and the small number of cases admitted to the hospital at that time probably explains the small number of cases that occurred before August.

† The high incidence in September and the rapid fall in October may have been due to the fact that the men had learned better how to take care of themselves and how to rid themselves of lice as soon as they become infested.

It is evident that the incidence of trench fever, though fluctuating greatly, showed no signs of diminution up to the end of April. From the time of the institution of the complete delousing methods only one new case developed for a period of five months. The occurrence of two cases in October may have been due to the fact that during this month the admissions were greater than at any previous time and contained a larger number of seriously and dangerously ill patients. It is more probable that both cases developed as a result of individual negligence. One was employed on the statistical staff and was found to have caught lice by sitting on the edges of the stretchers while he obtained particulars from the patients at the time of admission. The other became infested by handling blankets needlessly when acting as a stretcher-bearer. Neither of them had been supplied with suits. The most important point is that no man who wore a louse-proof suit contracted trench fever; only two found lice on their persons—a single louse each.

A comparison of the number of trench-fever cases admitted to hospital before and after the institution of complete precautions in May does not explain the fall in trench-fever morbidity among the hospital personnel. Nor can the fall have been due to any immunity on the part of the men, because the personnel was changing constantly, losing men and receiving reinforcements in return.

The amount of man-power saved by these measures cannot be estimated in terms of the incidence of cases of trench fever, but in the number of days spent in hospital. Table II shows the "hospital days" due to various types of diseases from October 1, 1917, to November 1, 1918. Statistics previous to this time are no longer available.

TABLE II

Type of disease	Days in hospital	Per cent
Respiratory diseases	1,645	42.3
Trench fever	915	23.5
Probable trench fever	397	10.2
Cutaneous infections	202	5.2
Gastro-intestinal diseases	154	4.0
Accidental injuries	127	3.3
Nervous disorders	66	1.7
Venereal diseases	202	5.2
Miscellaneous	178	4.6
Total	3,886	100.0

Table III shows the number of men in hospital during the same period, arranged according to the type of disease.

TABLE III

Type of disease	Men in hospital	Average No. of days in hospital
Respiratory diseases	112	14.7
Trench fever	26	35.2
Probable trench fever	11	36.1
Cutaneous infections	19	16.3
Gastro intestinal diseases	27	5.7
Accidental injuries	10	12.7
Nervous disorders	6	11.0
Venereal diseases	6	33.7
Miscellaneous	21	7.7

The duration of the average case of trench fever is longer than the average duration of any other type of disease. Most of the

patients were admitted at least twice and one of them as often as four times on account of relapses. Two men had to be returned to the United States for repatriation on account of a severe "effort syndrome" associated with chronic trench fever, and several of the others were relieved from heavy duty for variable periods for milder degrees of the same condition.

Conclusions.—It has been successfully demonstrated that louse infestation can be prevented among the personnel of a base hospital in France, and a routine by which this end was attained has been described.

It is our opinion that any less drastic measures could not have accomplished this end, and that the time, trouble and expense entailed in the establishment of this routine were economically spent, in the light of the conservation of man-power effected.

HODGEN SUSPENSION SPLINT[1]

By Major HARVEY G. MUDD
Medical Corps, United States Army

(With three illustrations)

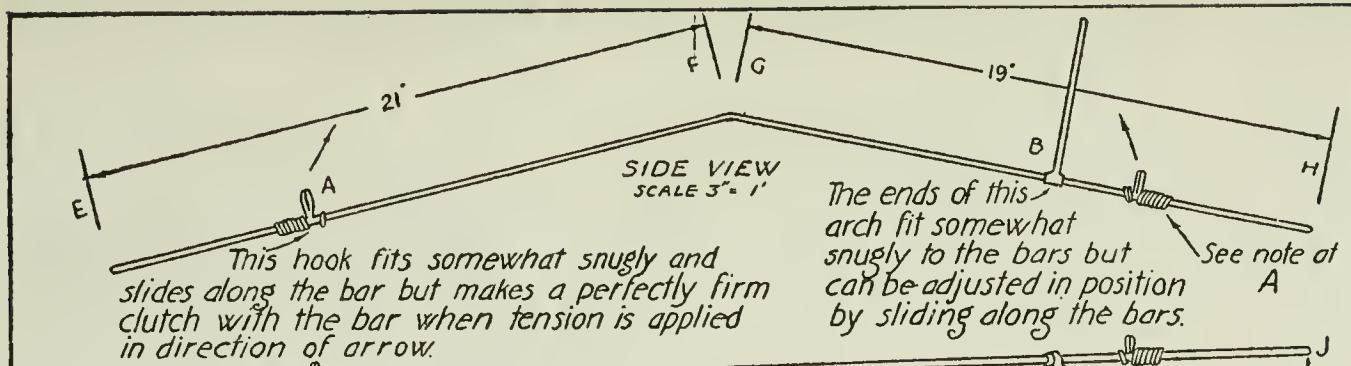
THE Hodgen Suspension Splint was devised during the Civil War for the treatment of compound (gunshot) wounds of the femur. Simple, continuous extension as obtained by oblique suspension was first used by Nathan R. Smith when he introduced his anterior splint. The Hodgen suspension splint is a modification of the Nathan R. Smith anterior splint and utilizes the same principles of extension by oblique suspension. The Hodgen suspension splint, properly used, needs no modifications to obtain the best results in fracture of the femur.

It offers "the most equable, perfect and comfortable extension yet devised. It is easily adjusted; the thigh is exposed for inspection. The muslin supports, forming a cradle in which the thigh and leg rest, can be separately adjusted. The tension on any one of them changed, and in this way the normal anterior curvature of the femur can be maintained, notwithstanding the rapid atrophy of the soft tissues after fracture of the femur. Oblique fractures of the shaft of the femur usually adjust themselves satisfactorily under the influence of continuous traction. Transverse fractures with lateral displacement and overlapping require more than a complete extension to secure proper adjustment. They require direct lateral pressure to force the fractured ends into position. Failing by this means to obtain proper adjustment one may succeed by increasing the angular deformity even to 90 degrees, until the ends can be put in apposition; then with extension and gradual straightening of the leg; meanwhile maintaining firm lateral support at the point of fracture, the fragments may be adjusted. It is not easy to determine that adjustment is good, for the bone is enveloped in a mass of muscle and is so placed that it cannot be

[1] The Army has incorporated the Hodgen splint among its list of standard splints. Unfortunately the efficiency of this highly useful splint is lessened by a fairly widespread failure to understand either its manufacture or its proper application.

The most satisfactory description was written by the late Dr. Henry Mudd and published in Park's "System of Surgery," a treatise that is not commonly procurable. In view of this fact, Dr. Harvey G. Mudd of St. Louis was requested to submit to the Surgeon General accurate data and instructions for the manufacture and use of the splint. These are reproduced in this issue of The Military Surgeon for the information of members of the Medical Corps. The specifications and drawings are originals made by Dr. Mudd. The text is in part paraphrase and in part direct quotation from the article in Park's "Surgery," which, according to Dr. Mudd, represents the clearest possible exposition of the Hodgen splint.

Note: All quoted paragraphs are taken from the article written by H. H. Mudd for the first edition of Park's "Surgery."


21"
F
G
19"
E
A
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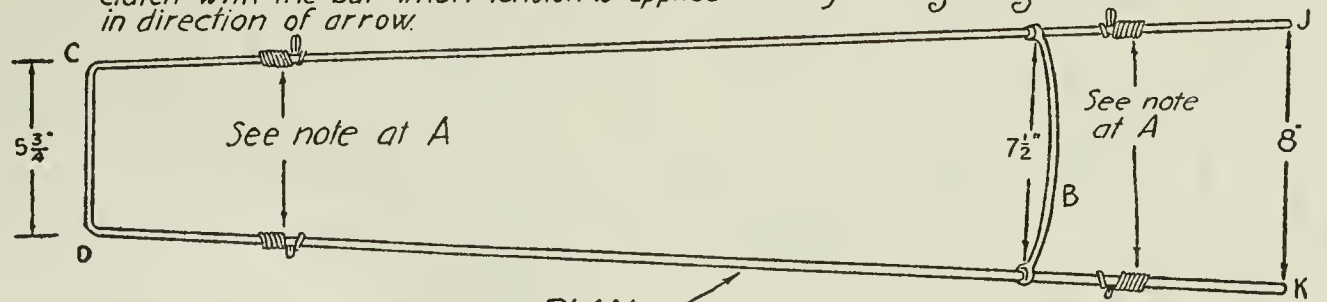
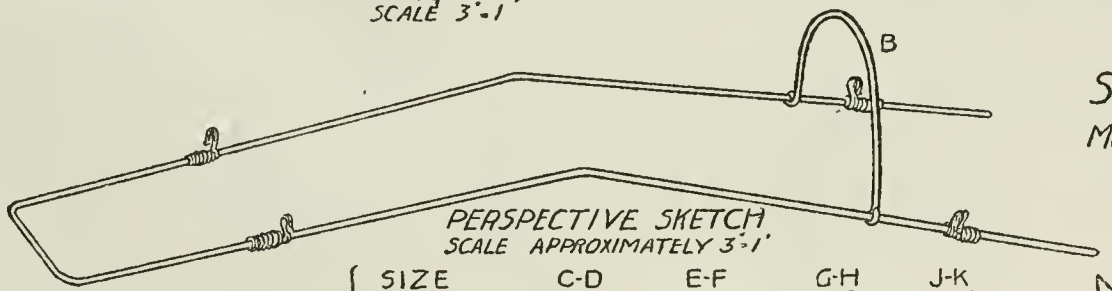
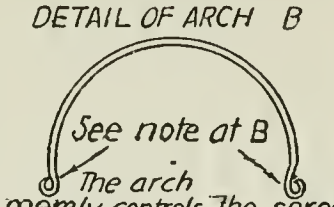
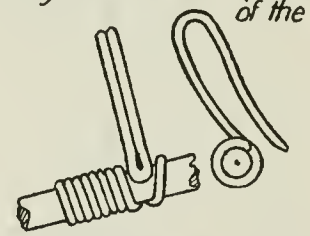
SIDE VIEW
SCALE 3"=1'
This hook fits somewhat snugly and slides along the bar but makes a perfectly firm clutch with the bar when tension is applied in direction of arrow.
The ends of this arch fit somewhat snugly to the bars but can be adjusted in position by sliding along the bars.
See note at A









Detail view of one of the wire hooks (the one at A) full size

HODGEN SUSPENSION (CRADLE) SPLINT

Material. ¼" BESSEMER copper-coated steel wire

Hooks made of 5/64" iron wire

SPLINT SHOWN IN DETAIL IS 20 YEAR OLD SIZE

OTHER SIZES REQUIRED:-

SIZE	C-D	E-F	G-H	J-K
16 YEAR	5½"	19"	17"	7½"
18 "	5½"	20"	18"	8"
22 "	5¾"	22"	20"	8"

MEDICAL DEPARTMENT U.S.A.

DIVISION OF ORTHOPEDIC SURGERY.

distinctly outlined." If the thigh does not shorten on cessation of extension it indicates that the broken ends are in apposition. Intercondyloid fractures require extension and lateral pressure on the condyles to secure good apposition in the vertical lines of fracture.

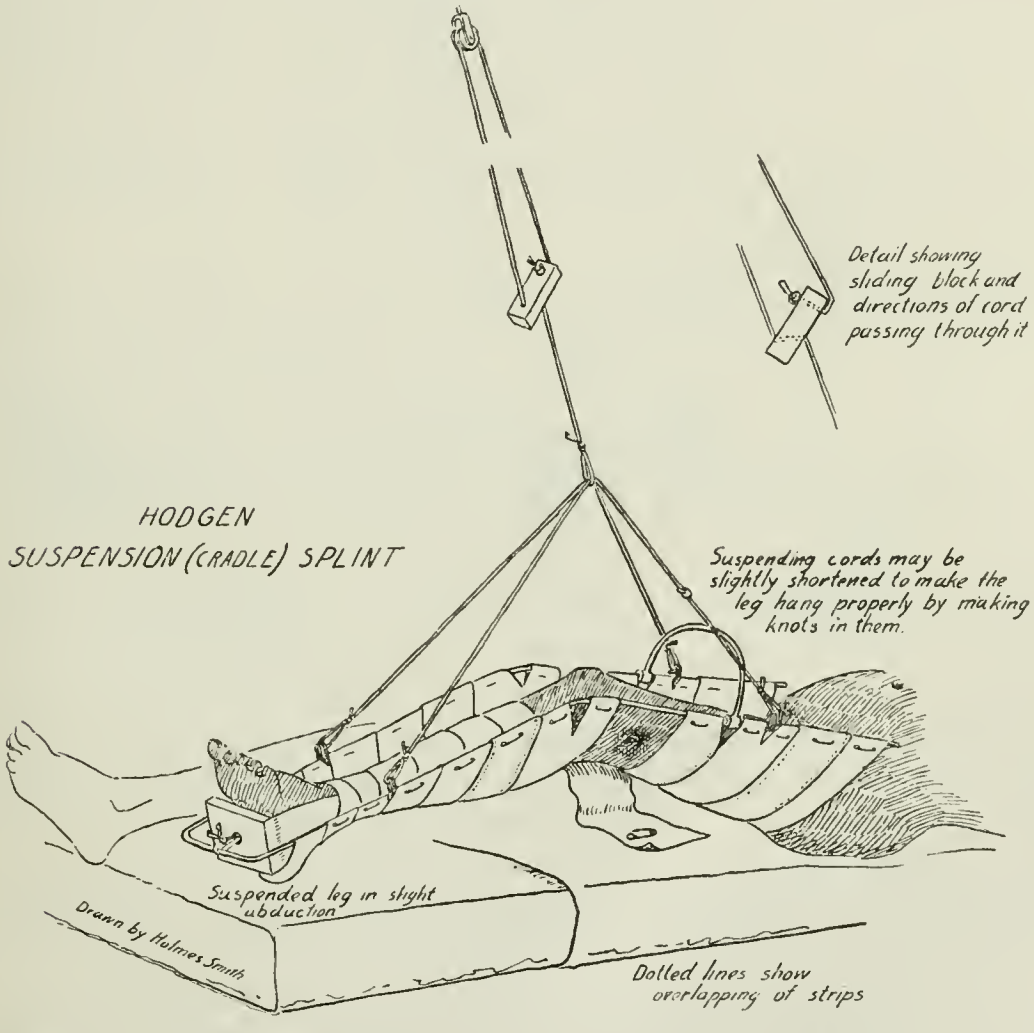
Fracture in the shaft and lower end of the femur can be perfectly immobilized in the Hodgen splint. Properly adjusted it comes nearer adjusting and immobilizing fractures of the neck, intra-capsular or extra-capsular, than any other method of treatment.

"If the fractured ends are in apposition, the movement should be easier at the head than in the fracture. The head of the femur should move with the neck if adjustment is good; the swing of the leg does not imply that the movement is at the break."

"Moderate extension approximates and sets the fracture of the neck. The impacted fractures at the base are not disturbed by the moderate equable extension. Displacement by rotation can be avoided in this splint. If pressure upon the trochanter is desired, it can be secured by a flannel bandage about the hips. The freedom of the motion allowed the patient does not interfere with the union of the broken shaft, as the splint and the leg are free to move with the body of the patient. The only motion is at the hip-joint, and there is no possibility of angling at the fractured point by the dragging of the leg on the bed as the patient moves from one side to the other. The patient can sit upright in bed or use the bedpan without disturbing the fracture."

"The application of the Hodgen splint is simple and in skillful hands is painless. Suppose the leg with its fractured femur to be resting upon the bed. The adhesive strip, with its foot-piece and cord, is placed in position; an assistant grasps the foot with one hand, and with the other hand under the knee lifts the leg from the bed, while at the same time he makes steady extension of the femur. The surgeon applies the roller as high as the plaster extends, binding it to the limb. The leg is again allowed to rest on the bed; the assistant maintains moderate traction on the foot so that the extending force applied to the fractured bone may be continuous. The splint is then put into position. The lateral arms of the splint are held apart by a metal arch; one arm of the splint is placed upon either side of the leg and the cross bar is brought close to the sole of the foot. The cord secures the block to the foot of the splint. Strips of muslin are passed under the leg—one at the ankle, one at the knee, and perhaps two under the thigh. These

are secured by pins to the lateral arms of the splint, while it is held so that the inner arm extends above the tubes and its outer arm reaches nearly to the crest of the ilium, the lower end of the splint being on a level with the malleoli. The inner wire may be shortened or bent upward so as to give the patient opportunity to sit upright, but it should always extend to a point in front of the pubic bone. The leg can now be suspended by attaching the cords and adjusting the slide so as to lift the splint and leg from the bed. The cradle, of cloth strips, upon which the leg is to rest is now made complete by adding strips of muslin and adjusting them to the outline of the leg as indicated in the cut."


Detail showing sliding block and directions of cord passing through it
HODGEN
SUSPENSION (CRADLE) SPLINT
Suspending cords may be slightly shortened to make the leg hang properly by making knots in them.
Suspended leg in slight abduction
Drawn by Holmes Smith
Dotted lines show overlapping of strips

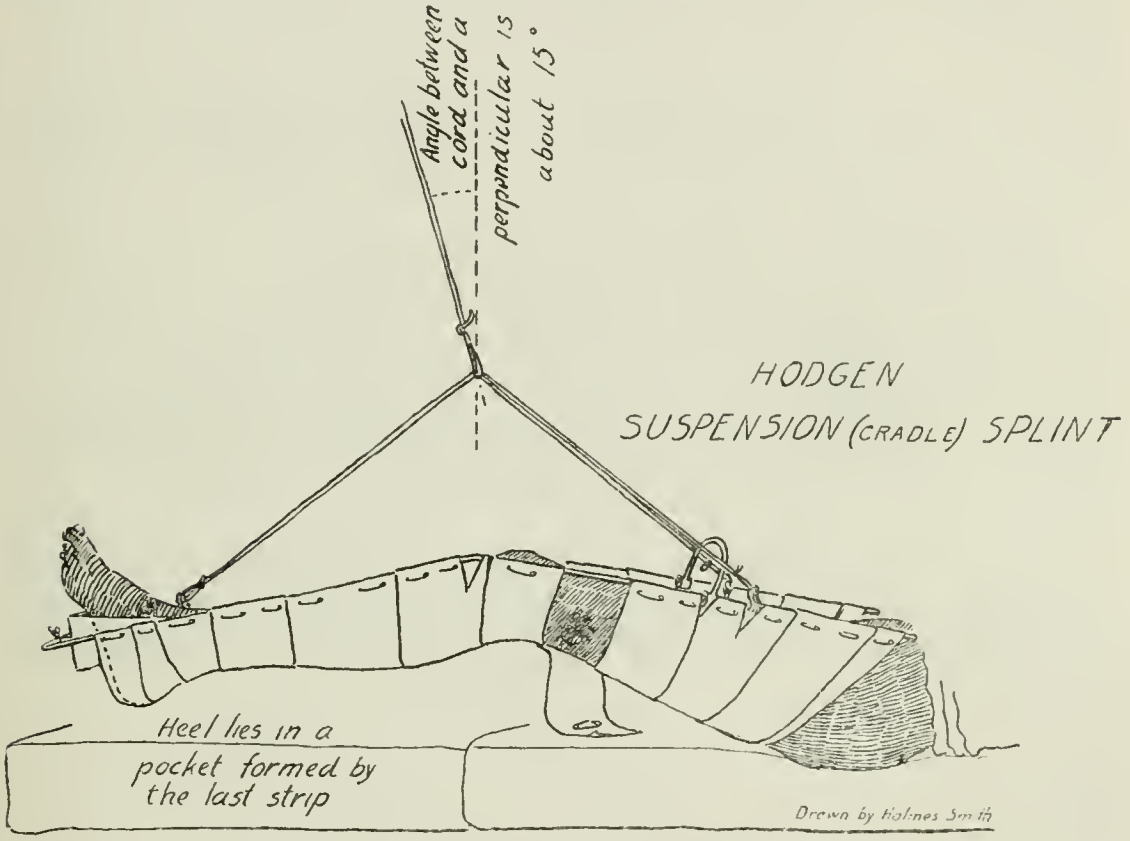
"No special or violent attempt to adjust the fractured bone is made except where there is lateral displacement of a transverse fracture. The free swing of the leg and the efficiency of the extending force secure adjustment of the ordinary oblique fracture in a few hours. The flexion of the leg on the thigh should be very slight, not more than an angle of 170 degrees; for if the bend approaches

a right angle the elevation of the knee is necessarily great, and most of the extending force applied to the thigh would be through the muslin strips on which the upper part of the leg rests (those just at and below the bend of the knee). The angle of flexion at the knee may be varied from that of the splint by lengthening or shortening the strips which support the thigh. The foot may be elevated or lowered, and the support rendered by the muslin strips under the thigh varied by sliding the loop downward toward the foot or upward toward the groin. The flexion of the knee is only sufficient to put the leg in a comfortable position, slightly relaxing the tension of the hamstring and gastrocnemius muscle; the slight flexion of the thigh on the pelvis with extension puts at rest the psoas and iliacus and the rectus extensor of the thigh. External rotation, if it occurs, can be obviated by securing the foot to a foot-piece or by a muslin strip passed around the outer border of the ball of the foot and fastened to the inner arm of the splint. A foot-piece can be easily adjusted to the splint if it is thought desirable to steady the foot in a fixed position."

"The degree of extension necessary to accomplish the result desired may be determined in part by the sensations of the patients. It is never necessary, when using this splint in the adult, to apply (as recommended by Hamilton when speaking of other methods of making extension) 20 pounds as an extending weight. An extension of 20 pounds applied through an adhesive strip to the leg, and pulling upon the knee joint and femur, is a serious trial to the patient's endurance, and it taxes the surgeon's ingenuity to steadily maintain such a force. The amount of extension required in this suspension splint is much less, being from 3 to 10 pounds. There is no friction to overcome, and so long as the patient remains in bed there is no appreciable variation in the extending force, *provided the point of support is 10 feet or more above the plane of the bed.* It is a quiet, persistent, non-irritating, effective pull. There is no perineal band to fret and worry the patient. The extending force is determined by two factors, and these are entirely within the control of the surgeon, viz., the obliquity of the extending cord and the weight suspended. The first can be varied by the relative position of the bed and the suspending pulley, and the latter can be increased, if desired, by placing sandbags across the lateral bars of the splint."

"It seems difficult for some surgeons to understand how extension can be applied to a fractured thigh by direct traction upon the leg without counter extension through the perineal band. They fail

to recognize the efficiency of the weight of the leg as an extending force. The amount of the extension in a particular case where the patient weighed 150 pounds was calculated mathematically and estimated at 6.1 pounds. The suspending cord in this case formed an angle of 15 degrees with the perpendicular, and the weight of the leg was estimated as being 21 pounds. The suspended limb should not be raised much above the bed, the heel remaining within 2 inches of the bed. If the pulley from which the splint is suspended


Angle between cord and a perpendicular is about 15°
HODGEN
SUSPENSION (CRADLE) SPLINT
Heel lies in a pocket formed by the last strip
Drawn by Holmes Smith

is fixed in a ceiling that is 9 to 12 feet high, a perpendicular line dropped from the pulley should fall beyond the foot of the adult patient. The obliquity of the cord should be sufficient to make an angle of from 15 degrees or 35 degrees with the perpendicular. *The point of fixation for the pulley for suspension should not be nearer the plane of the bed than 10 feet.* This gives the patient the full liberty of the bed without changing materially the extending force. The inclination of the patient to slide toward the foot of the bed may be obviated by raising the foot of the bed by means of blocks."

"The nutrition is undisturbed, for the circulation is not interfered with by the pressure of retentive apparatus, and it is as perfect as it can be during enforced quiet. The leg can be kept cool

or warm, as desired. The patient may sit up or lie down as comfort suggests. The bed-pan can be used without disturbing the fracture, and the best possible result can generally be obtained, viz., early union with no appreciable shortening. This is obtained without bed sores or any of the constitutional complications which are liable to follow confinement in a fixed position."

"The splint is well adapted to the treatment of all fractures of the femur, whether they are intra- or extra-capsular, through the trochanters, the shaft and the condyles. The results of the treatment of fractures of the neck of the thigh with this splint are very satisfactory in the majority of cases. Most of the unsatisfactory results obtained are probably due to imperfect adjustment of the fractured ends, or are found in the fractures that occur in the neck very near the head."

"This method of applying extension affords a most perfect means of neutralization of the tonic contraction of the muscles. The oblique suspension gives equable and continuous extension of an amount sufficient to accomplish a perfect result without the waste of any force, and it ensures the patient the most perfect liberty obtainable by any known means compatible with comfort and safety."

"In fractures of the neck of the femur it is necessary to so adjust the splints as to raise the end of the femur and give it very efficient support and at the same time to have a fair amount of abduction of the leg."

NEW CYSTOSCOPIC FINDING IN CASES OF ENURESIS

By 1st Lieutenant IVY ALBERT PELZMAN

Medical Corps, United States Army

IN THIS preliminary report, which is based on an examination of sixty cases of enuresis, a new cystoscopic picture is reported. Although numerous papers have been written on the subject of enuresis in children, there are but few observations in the literature relating to its occurrence in adults.

Enuresis in the adult is a condition far more common and of vastly greater importance than this dearth in the literature has led us to suppose. In the routine cystoscopic examinations at the base hospital at Camp Meade, Maryland, over a period of five months, forty cases of enuresis were encountered (the number would have been much larger had all the cases been sent to the hospital.) These cases were referred from the venereal station in the camp, where in four weeks twenty cases of enuresis were examined. From this it is quite evident that the condition is far more prevalent than is commonly believed.

The history in each of these cases is practically identical. The condition starts in infancy, the man voiding from eight to ten times during the day and wetting the bed at night. There was always a history of at least one other member of the family affected by the same condition, and in several, more than one additional member of the family was so affected. The men were neurotic and of an unstable type; almost without exception they would state that they were nervous.

Cystoscopic examination, disclosed no residual urine—the bladder was filled with 300 to 400 c.c. of sterile water. A trabeculated bladder was found, trabeculation varying in degree from a mild to a very marked type. In most instances the floor of the bladder was involved, the trabeculations radiating outward and posteriorly from the ureteral orifices; in the more marked cases the entire bladder wall presented this picture. The findings were practically the same as those presented by the trabeculated bladders in tabetics. Very few of the cases showed any evidence of cystitis, although in several there were signs of a moderate degree of trigonitis. As far as the writer is able to ascertain, no such picture has been previously described in cases of enuresis.

There appears to be no doubt that the enuresis present in these cases is a symptom of a neurological condition. We are dealing with a condition which is caused by a hyper-irritability of the nerve supply of the bladder. This hyper-irritability is either produced by a definite organic disease of the vesical nerve supply or by neurosis. In one case

with marked trabeculation involving the entire bladder wall, subsequent cystoscopy under general anesthesia disclosed that during the first excitement stage of anesthesia the trabeculations were more marked, disappearing when anesthesia was complete. As the patient came out of the anesthesia the trabeculations again returned.

Two cases of enuresis were referred for cystoscopic examination by the neurological department; a diagnosis of constitutional psycopathic state had been made in both. On cystoscopy a trabeculated bladder was discovered in both cases.

These cases do not come to the attention of the civilian specialist because of the fact that they are rarely referred to the urologist. None of these patients had ever been cystoscoped before, although all of them had been treated by family physicians with the usual pills and medicines. Weekly inspection of enlisted men's bedding, close proximity in living quarters, and the fact that regimental surgeons refer cases to the urologist for diagnosis and treatment, account for the fact that so many cases of enuresis are seen by the urologists in army camps.

In the past, the opinion has been that enuresis in the adult is merely a habit which will in time disappear, or, as has so often occurred in the army, the man is accused of malingering. The differentiation in these cases is very sharp. Cystoscopic examination of a true case of enuresis always shows a trabeculated bladder, while in the case of a malingerer no such lesion is found.

The neurological and therapeutic aspects remain a subject for future investigation. At this writing there is nothing to offer regarding a cure for the condition; it is hoped that in a subsequent study of the subject something definite may be evolved.

REPORT ON SIX HUNDRED AND THIRTY-EIGHT HERNIOTOMIES

By Major W. T. DODGE, M. C., U. S. A.

Chief of Surgical Service, Base Hospital, Camp Sherman, Ohio

ON MAY 1, 1918, the surgical service at this hospital was notified that the 158th Depot Brigade contained approximately 500 men awaiting operation for hernia. Previous to this time a few herniotomies were performed, but on account of the existence in the camp of various epidemics with a tendency to bronchial and lung infections, no attempt had been made to dispose of the large number of men admitted to the camp for remediable hernia. By order of the division surgeon only cases presenting a reasonable prospect of success from a military standpoint were operated on, and those with large hernias with weak abdominal walls were refused operation. A member of the surgical staff was designated to examine all cases and as a result of this, approximately 10 of the cases were rejected and discharged from the service. The number of cases remaining was 492, presenting 638 hernias, as follows: right inguinal, complete 128, incomplete 190; left inguinal, complete 83, incomplete 207; femoral, 7; umbilical, 12; ventral, 11; total, 638. These cases were operated upon between May 1 and July 31, 86 in May, 326 in June and 226 in July. The operations performed were as follows: Bassini, 512; Ferguson, 94; McEwen, 2; femoral, Ochsner, 2; imbricated fascia, 5; umbilical, Mayo 12; ventral, 11; total, 638.

The personnel of the staff at the base hospital was constantly changing, since it served also as a training school for officers, nurses and enlisted personnel. Consequently officers frequently left on assignment to oversea units and others were constantly reporting from civil life or from training camps. It was the custom of the chief of this service (during the period covered by this report, Maj. C. T. Sturgeon), to assign each member of the staff to his turn in the operating room, either as operator or assistant of a team in charge of one operating table. The number of operators concerned in this series was, therefore, very large, and each operator decided on his own technique. It would be reasonable to conclude that under these circumstances the results in a large series of cases would not be so favorable as in a similar series operated by one skilled and experienced surgeon. While there were among our operators many distinguished and experienced surgeons, there were also many young men fresh from interneships. It was the custom to associate the young men with the experienced in order to afford them instruction in operative work. At first, there was much difference in

technique, but later the practice became quite uniform. In the majority of cases the sac was separated and ligated high up and permitted to slip up under the internal oblique and was not Kocherized. The shelving edge of Poupart's ligament was attached to the conjoined tendon with No. 3 chromic catgut sutures and the cord transplanted, the external oblique being sutured with continuous chromic gut. Skin and superficial fascia were closed with interrupted silkworm gut sutures. In 94 cases the cord was not transplanted, this being the only distinction between the so-called Bassini and Ferguson operations.

The routine of preparation for operation was the same for all, and was as follows. The patient's abdomen was shaved and scrubbed the day before operation and then covered with sterile gauze, which was removed in the operating room. Castor-oil was given two days previous to operation if the patient was in the hospital; under no circumstances was a laxative given the night before operation. After the patient was anesthetized the abdomen was washed with benzine, dried and painted with 3½ per cent tincture of iodine. The operators' hands were scrubbed with green soap and hot water for ten minutes, soaked in lysol solution for two minutes and rinsed in sterile water, dried and covered with rubber gloves sterilized in the autoclave. Fresh gloves were of course donned for each operation, but the aprons were not always changed unless soiling had occurred, the fronts being covered with fresh sterile towels. The wounds were covered with sterile gauze securely fastened in place with adhesive strips and not disturbed for ten days. Patients were permitted to sit up in two weeks and in three or four weeks were discharged to the infirmary of the development battalions with the understanding that they should not be returned to full duty for two months after the operation.

There were nine cases of superficial infection, the organism in each case being the staphylococcus albus; these did not interfere with wound healing or with the success of the operation. In one case of recurrence coming to the attention of this service, there was no infection. The cord was not transplanted, a procedure adopted at the second operation.

It was not practicable to conduct operations regularly in the afternoon, as the nurses required that time for preparations for the following day. A plan was adopted on June 1, which made it possible to perform many operations in a short time in addition to caring for the large amount of other operative work. Two operating tables were placed in one room, engaging two operating teams at the same time. One member of the staff had charge of preparing the patients and starting the anesthetics, so that the operators were subjected to no delays

between cases. Three anesthetists were always available, as well as four nurses and a sufficient number of orderlies. Other teams could thus care for other classes of cases in the second operating room. Ether was the universal anesthetic used, except in a few cases toward the last of the series, when nitrous-oxide-oxygen was employed. By this method on some days twenty-five herniotomies were performed between 7.30 a. m. and 12 m.

A few cases of pneumonia with type IV pneumococcus developed, and finally a severe outbreak occurred in one ward, with nine cases in one day. This led to a survey of the ward by the laboratory under the direction of its chief, Maj. C. P. McCord. Of 48 people connected with the ward, pneumococcus type IV was found in the throats of 44. This ward was quarantined, the inmates caused to use a gargle of a solution of 1:10,000 quinine bi-sulphate. After three days, all the throats being found sterile, operations were resumed and no further cases of pneumonia occurred. This experience led to adoption of the rule that all patients use this gargle on two days preceding the administration of ether; no further case of post-operative pneumonia was recorded after this. The disease in nearly all cases terminated by crisis in four days, and all those affected recovered. The surgical staff acquired so much faith in this simple gargle as an agent to destroy pneumococci in the throat that they faithfully used it during the influenza epidemic in October. No member of the surgical staff, nor nurses or orderlies connected with the operating room contracted pneumonia during the epidemic, although all of them worked on the medical service and were repeatedly exposed to the infection. Several of them had influenza. The quinine solution appears to be a specific germicide for the pneumococcus, but not for other organisms.

It is not possible to report definite results in all these cases on the question of permanent cure of the hernia. Only one case has come to attention with a recurrence. This patient was operated in July and was sent to the disability board at this base hospital in September with a request for his discharge on account of recurrent hernia. Reference to his history disclosed that he had been operated upon by a competent surgeon, that he had suffered from no infection, and had been discharged from the hospital three weeks following operation. It transpired that he had been sent to his organization instead of a development battalion and had been subjected to full duty at once. He was admitted to the hospital and reoperated on with satisfactory results. Three hundred and ninety-two of the cases composing this series were transferred to Development Battalion No. 2. The infirmary of that battalion has the records of all discharged from the service and of the present disposition

of those remaining in the battalion. These records number 178 cases; the remainder were transferred to other camps or organizations. That leaves 100 who were returned to their line organizations or to other development battalions. Many of them were members of the Base Hospital Detachment and are still on duty.

In a development battalion the men are classified as follows: Class A (fit for general military service); Class B (fit for limited military service, but in good condition; able to march 5 miles a day); Duty Grade (fit for labor organizations).

On November 14, 1918, the commanding officer of Company C, Development Battalion No. 2, kindly informed me that the 178 hernia cases remaining in his organization, including all the cases discharged by the Disability Board of the 158th Depot Brigade, were classified as follows: Class A, 28 per cent; Class B, 43 per cent; Duty Grade, 23 per cent; Discharged, 6 per cent.

"Of those discharged 4 per cent were for other causes than hernia. Of the 43 per cent Class B men, 40 per cent will be placed in Class A within the next thirty days. The 23 per cent duty Grade will be placed in labor organizations and are so placed for other reasons that their herniotomies."

It appears then that in an average period of four and one-half months there have been 2 per cent of recurrences in 178 cases. This really includes all the known recurrences in 392 cases, the remainder having been transferred to other camps, free from recurrence. In course of time recurrence will no doubt take place in other cases, but it is not likely to exceed 2 per cent of all cases operated. This result compares very favorably with results obtained by individual operators in large series of cases. No death occurred in the series.

In conclusion I would express the opinion that the treatment of the sac is the most important thing to consider in performing a herniotomy for inguinal hernia. If the sac is thoroughly separated from the tissues of the cord and ligated at the reflection of the peritoneum the hernia is not likely to recur, whether or not the cord is transplanted in subsequent proceedings. Many of our cases were of the incomplete type; it is necessary in such cases to raise the cord in order to locate the sac which invariably comes out of the abdomen underneath the cord. Many of the operators transplanted the cord in all cases of this kind, and did not transplant if they found it unnecessary to raise the cord from its place in the canal. Exposure of the shelving edge of Poupart's ligament, freeing it from fascia, and securely sewing it to the conjoined tendon, either under or over the cord, is considered vital to the permanent cure of the hernia.

A BRIEF RÉSUMÉ OF THE X-RAY WORK IN AN EVACUATION HOSPITAL

By Captain IRA H. LOCKWOOD, *Medical Corps, United States Army*
Evacuation Hospital No. 1, A. E. F.

EXPERIENCE in military roentgenology during the present war has served to emphasize the importance of rapid and reasonably accurate methods for the localization of foreign bodies. In base hospitals, as in civil hospitals, methods which require a considerable amount of time can be used and it is usually possible to consult the surgeon and make repeated observations to an extent quite impossible in an evacuation or mobile hospital.

In order to work on an extensive scale it has been necessary to consider very carefully the relation of the X-ray work to surgery, to analyze very closely the methods with reference to simplicity and accuracy and to pay particular attention to the reports and other information needed by the surgeon in order to facilitate his work.

In an evacuation or mobile hospital, speed and accuracy are essential and one will readily recognize that lack of time eliminates the use of radiographs. Dependence must be put almost entirely upon fluoroscopic methods. In selecting the methods at this hospital, no effort was made to obtain any universal or new procedure, but after extensive experimentation with many methods, it was deemed wise to limit the selection to a very few that seemed to meet best our own requirement: (1) A simple apparatus, (2) a process of manipulation not requiring an undue amount of skill, (3) a minimum amount of time, (4) exclusion of all likely sources of error, (5) consideration regarding the comfort of the patient.

It was necessary to bear in mind that the operator has an essential part to play in localizing foreign bodies. It was therefore expedient to choose those methods which would relieve him of unnecessary computation and thus reduce the chances of error. This was especially true when a large amount of work had to be done under conditions necessarily trying and with long hours of duty. The work was entirely new to a majority of the roentgenologists, and, regardles of the training they had received at the various schools, in many cases it was necessary to start at the beginning and teach them not only how to use the apparatus, but also the methods of localization and how to state the findings on their reports so that the surgeon would be able to interpret them without sending for the roentgenologist, entailing a loss of valuable time

for all concerned. There are certain points that we have tried to impress upon the younger operators, and these are:

1. The report must be short and concise, and state: (*a*) The depth and size of a foreign body in millimeters; (*b*) the anatomical position of the part when the localization was made.

2. The localization of the foreign body should be performed with the patient in the same anatomical position that the surgeon would place him in while operating.

3. As much time as possible should be spent in the operating room, watching the removal of the foreign body and determining in one's own mind the question, "How could I have improved that localization?"

The methods of localization selected were: (1) The 26° 34″ method; (2) the Strohl method; (3) the single tube shift method; (4) the near-point method; (5) the Hirtz compass method.

We will not attempt to go into detail regarding these methods; suffice it to say that we have used the single-tube shift method more extensively than the others, with very accurate results.

We have found very little use for fluoroscopic assistance in the operating room, but we can readily see its advantages in a base hospital where the wound of entrance has healed, or partially healed, and we believe that the method of choice for this particular work is the Dessane bonnet with the X-ray apparatus in the operating room.

The following is a brief résumé of a number of consecutive cases:

1.

Number of cases examined	5,000
Number of cases with retained foreign bodies	1,992
Number of foreign bodies localized	5,625
Number of cases with single foreign body	1,043
Number of cases with mutiple foreign bodies	949
Number of cases with fractures	1,741
Number of bones fractured	2,796

2. Cases with foreign bodies in the soft tissues, in the following anatomical parts:

Abdominal wall	56	Hand	153
Ankle	47	Head	111
Arm	173	Hip	53
Back	130	Knee	98
Buttocks	132	Leg	318
Chest wall	192	Neck	94
Face	141	Shoulder	179
Foot	134	Thigh	528
Forearm	175	Wrist	30

3. Cases with foreign bodies buried in the following bones:

Carpal bones	1	Metacarpal bones	2
Cranial bones	2	Metatarsal bones	3
Facial bones	2	Patella	1
Femur	19	Scapula	1
Fibula	3	Tarsal bones	13
Humerus	4	Tibia	15
Ilium	1	Ulna	3

4. Cases having foreign bodies in joints:

Ankle	2	Knee	10
Elbow	5		

Number of cases having foreign bodies intracranial..... 24
Number of cases having foreign bodies intrathoracic..... 87
Number of cases having foreign bodies intra-abdominal..... 71
Number of cases having foreign bodies intra-renal..... 1

6. Cases with fractures of the following bones:

Carpal bones	37	Patella	18
Clavicle	41	Pelvic bones	20
Cranial bones	66	Phalanges of foot	75
Face bones	39	Phalanges of hand	172
Femur	186	Radius and ulna	199
Humerus	175	Ribs	48
Jaw	21	Tarsal bones	95
Metacarpal bones	104	Tibia and fibula	352
Metatarsal bones	112	Vertebræ	15

7. Chest examinations (286) with the following pathological conditions:

Hemothorax	72	Broncho-pneumonia	7
Pneumothorax	19	Influenza	20
Intralobar effusion	31	Empyema	6
Pleural effusion	25	Cardiac hypertrophy	4
Lobar pneumonia	10		

It may be interesting to note the predominance of cases having foreign bodies in the extremities, as shown by the following percentages of cases with retained foreign bodies:

	Per cent		*Per cent*
Thigh	27	Head	5
Leg	16	Abdominal wall and intra-abdominal	7
Forearm	8		
Arm	8	Chest wall and intrathoracic	14

The roentgenologist has been of great assistance in the early diagnosis of gas gangrene, before the appearance of the cardinal symptoms. In this we have found the fluoroscopic examination fully the equal of the radiograph. Very frequently one finds a single

large globule of gas about a foreign body, and, upon incision, the gas escapes. These large globules of gas are apparently formed by a non-virulent type of organism and we have termed it localized gas infection, differentiating it from general gas infection, which always gives the typical findings of small gas globules radiating along the course of the sheaths of the muscles, later involving all the soft tissues. In our experience the localized gas infection seldom occurs unless a foreign body is present, while in the case of the general gas infection we have found that the most severe cases are those in which the metal foreign body has passed through the part, producing a punctate wound of entrance and exit and leaving in the soft tissues some foreign material, especially clothing, that has been carried in by the metal projectile.

I wish to express my gratitude to Col. George H. R. Gosman, commanding officer of Evacuation Hospital No. 1, for permission to present this résumé and for his kind assistance at all times, to the surgical and medical staffs, and to others who have given hearty coöperation to this department.

EDITORIAL

THE DOUGHNUT OR THE HOLE

On either side of the avenue of life stand "Construction" and "Destruction" sticking out their tongues at each other, much to the amusement of the passers-by. They are the twins of history and oftentimes it is difficult for the man in the street to distinguish between them.

"Construction" is generally distinguishable from his bad brother, but nevertheless, and in spite of his evil reputation, the wicked twin may at times serve a useful purpose in stimulating and laying the approach to a method of reform in regard to matters which have been manifestly bad. There is probably no organization which is a fairer mark for the shafts of public comment than any one of those which are organized under federal control and which have, as the essence of their being, the support of the taxpaying citizen.

This sounds very much like an entirely irrelevant beginning, but we believe that it has a concrete application, and one which applies to us men of the service in very exact terms. Any of us who have taken the oath of allegiance, and have undertaken to carry out the duties which are delegated to our various stations, have felt the sting of the out-stuck tongue of the bad twin as represented by criticism, often based on faulty premises, and spread by the public press. We of the service are logically, and probably very properly so, fair game at any time when our work does not measure up to the standard which it is assumed it should reach. It may be that the fault does not lie with us fundamentally, that our shortcomings are due to statutory restrictions, to economic difficulties, to climatic vagaries or, as the exemption clause of the insurance policy puts it, "to other natural causes." This is not always taken into consideration, and the country we serve is apt to hold us to the 100 per cent perfection which is our ultimate goal and ambition, but which is, alas, so hard to attain in real life and under service conditions. If we had our way, there would always be a normal and necessary amount of transportation, ample personnel, sufficient supplies and all that which would make for the smooth running of a carefully planned organization. We cannot claim perfection, because, in the first place, we are human and therefore deserve a certain partial exemption under the first sentence of the proverb.

"To err is human"; our plans, however well conceived, are made in time of peace, under the limits of past experience, and are in a measure hypothetical. The acid test of war may show that our gold is dross and that it is requisite that we revise, revamp and change that we thought good, but now find bad, to meet different conditions and emergencies which we could not, with finite eyes, foresee.

In the second place, the utilization of our perfected and carefully selected matériel is dependent for its usefulness on the intelligent application by the personnel which administers it; and, alas, we are here again confronted by the question of human frailty. In all services there are those who by some strange psychology of appointing power slip by the requirements only to be tried and found wanting in the hour of bitter need.

For this we shall be always criticised. It may be constructive criticism, which, in addition to pointing out the fault, suggests a remedy. Or it may be the bad twin on the other side of the avenue who simply says we are rotten—ab-so-lutely rotten—and lets it go at that, believing in his inner consciousness that, having demonstrated to his own satisfaction the fact which he proclaims, he is under no obligation to help us in making better the service which he condemns.

We believe that both classes of criticism are of value; not of equal value of course, for that which finds fault and suggests a cure is a material help. Yet even pure destructive criticism should serve us as a spur—an angry spur, perhaps—to seek for a better way to do the thing condemned. Good work *has* been done under these conditions and probably will be in the future.

If we could induce those who so assail us for our assumed shortcomings to look well into all details before they condemn us, we believe that there might be at times a measure of praise for work well done under trying circumstances, rather than a scathing indictment for the "falling down" of a service which, like the engines of a ship, ought to work at any angle, at any rate of speed, no matter what strain is put upon it. Yet these same engines of steel and brass *do* fail at times under stress of work, and what is forgiven to tireless bronze should also be forgiven to the frailer human mechanism.

It occurs to us that we may take to ourselves some of the attributes in Kipling's poem, "The Sons of Martha."

"Her sons must wait upon Mary's sons, world without end, reprieve or rest."

* * *

"Wary and watchful all their days, that their brethren's days may be long in the land."

* * *

"And the sons of Mary smile and are blessed. . . . They sit at the feet—they hear the word, . . . "They have cast their burden upon the Lord, and—the Lord he lays it on Martha's sons."

Far be it from the "Sons of Martha" to chant their own praises, to do aught but their own appointed work as best they can, giving thought, time, patience, life, if necessary, to the "*Service*" which they are under oath to support to the uttermost. Yet there are many of Martha's Sons who would be grateful if those of the world outside "The Services," who are at times bitter with us, could understand what it all means and see the Doughnut instead of the hole.

JAMES ROBB CHURCH.

SHRAPNEL

We have noticed, in several articles dealing with wounds made by shell, the statement that "several pieces of shrapnel were removed." At the risk of appearing pedantic, and of stating what ought to be a generally understood fact, we desire to call attention to the fact that the shrapnel case *does not comminute.* There was, for a time, a "high explosive shrapnel" which carried a bursting charge as well as the normal load of shrapnel bullets. It was not satisfactory, however, and was abandoned. The normal shrapnel shell carries a powder charge in the base, above that the load of leaden bullets in a matrix of rosin, at its distal end a nose which contains the fuze, and the "gaine" in which is a small charge of Melinite. The fuze is set, or "punched" to burn for so many seconds, and at the expiration of this time the charge in the "gaine" is exploded, blows away the conoidal nose of the shell, after which the base charge is detonated and the bullets driven out of the case with the velocity of the propulsive charge plus that of the charge at the base. The blown-off nose and the case itself, *intact,* continue in flight in accordance with the laws of ballistics.

If any of you pick pieces of shell out of the suffering human system your one best bet is that they are fragments of a H. E. (High Explosive) shell, riven into shreds and scraps and fragments by the rending power of T. N. T.

Of course you all remember that the angle of dispersion of shrapnel is 14° and why that is important for the medical officer to remember.

And now we hope that some disdainful artilleryman will not come along and tell us that some part of our lecture is wrong, for our intentions are perfectly good. J. R. C.

SPEAKING OF GEOGRAPHY

When your copy of THE MILITARY SURGEON comes to you (promptly, we hope), do you ever think beyond that one copy? We mean, do you ever wonder where else it goes, what peoples read it? Probably not, any more than the generality of you had any more than a hazy idea of the makeup of the flag of our country before your attention was called to it.

It occurs to us that it might be of interest to have an idea as to its distribution. It goes to every State in the Union; to all our possessions. It is mailed to the following foreign states, and to many of them at more than one address. It is sent to subscribers in France, Guatemala, San Salvador, Italy, Denmark and Canada. We have subscribers in China, Norway, Switzerland, England and South Africa.

It makes its way to Belgium, India, Holland and New South Wales. It goes to Spain, to Sweden, Japan and Peru. South Australia gets it and Brazil and Java. Samoa and the Dutch East Indies have a chance to read your contributions and Salonika, Siberia, Egypt and Cuba are not denied this privilege.

That is a fairly broad distribution, is it not? No more than the publication deserves, we think, and we are at liberty to make this statement because its excellence depends on *you* as a member of the Association to maintain the standard which it ought to keep.

In our editorial in the January number, "A Personal Appeal," we called your attention to the fact that this standard of excellence was dependent on the interest which the members of the Association took in this, their publication, and that the editor, while he was ready to give his best efforts, was, after all, just the steward and that it was "up to you" who make up the membership to give to the rest of the readers, the benefit of what may be of interest and help to them.

Think it over next time you have a paper and are in doubt as to where to send it. J. R. C.

COMMENT AND CRITICISM

The following extract from the Report of the Acting Chief of the Militia Bureau for 1918 is reprinted as being of interest to medical officers who came into the service under temporary status.

It is believed that the information given is such as to warrant its reproduction in these pages. Attention is called also to pages 47 and 48, 69 to 73, and to appendix "F" of the same report, which contain further information and tables along these lines, but are too extensive to warrant reproduction herewith. The report covers the period from July 1, 1917, to September 25, 1918, and is published by the Government Printing Office at Washington. Copies thereof may be obtained from the Public Printer.

JAMES ROBB CHURCH.

SANITARY TROOPS

The sanitary desk of the Militia Bureau, working in conjunction with the Adjutant General's and Surgeon General's offices, had charge during the period August 5, 1917, to May 10, 1918, of all matters pertaining to the appointment, promotion, and assignment of the commissioned personnel of the Medical Department, National Guard in Federal service, the assignment of commissioned medical personnel to the division staffs and sanitary trains, National Guard divisions, and the passing upon reports of physical examination of all officers of the National Guard recommended for appointment, promotion, and discharge during the foregoing-named period.

In addition it compiled the Federal service, including the dates of muster into and out and remuster into Federal service, of all the commissioned personnel of the Medical Department of the National Guard, and a lineal list of the officers of the Dental Corps, National Guard, inducted into the Federal service.

It compiled data concerning the causes of rejection on account of physical disability for the National Guard inducted into the Federal service, and also for the commissioned personnel of the National Guard separated from the Federal service between August 5, 1917, and May 10, 1918.

In addition it had charge of all matters pertaining to the physical qualification or disqualification of the personnel of the United States Guards; also all matters pertaining to the sanitary troops of the National Guard organized subsequent to August 5, 1917.

COMMISSIONED PERSONNEL, MEDICAL DEPARTMENT

The following table shows for the several authorized grades the number of officers of the Medical Department who were drafted into Federal service August 5, 1917, pursuant to the proclamation of the President dated July 3, 1917; those who were appointed under the provisions of the act approved May 18, 1917; those not drafted but who were eligible for draft, and those whose qualifications and eligibility were passed upon by this bureau and

appointments authorized, subject to examination, for National Guard organizations to which was extended federal recognition subsequent to August 5, 1917:

Grade	Drafted Aug. 5, 1917			Appointed under act May 18, 1917			Not drafted Aug. 5, 1917			Recognized since Aug. 5, 1917, for National Guard not in Federal service			Total
	Medical corps	Dental corps	Veterinary corps	Medical corps	Dental corps	Veterinary corps	Medical corps	Dental corps	Veterinary corps	Medical corps	Dental corps	Veterinary corps	
Colonel							2						2
Lieutenant colonel	8						1						9
Major	252			1			17			21			291
Captain	140			3			10						153
First lieutenant	846	249		17	1		100	38		44	10		1,305
Second lieutenant			73			1			10			14	98
Total	1,246	249	73	21	1	1	130	38	10	65	10	14	1,858

The foregoing table shows that there were inducted into the Federal service for duty with the drafted National Guard 1,267 officers of the Medical Corps, 250 officers of the Dental Corps, and 74 officers of the Veterinary Corps, an aggregate of 1,591 officers of the Medical Department, National Guard.

Officers of the State staff corps and departments and the National Guard Reserves were not included in the proclamation of the President, although they were subject to draft and a number were inducted to fill vacancies. The number of those not so affected was 130 officers of the Medical Corps, 38 officers of the Dental Corps, and 10 officers of the Veterinary Corps, which, added to the 65 officers of the Medical Corps, 10 officers of the Dental Corps, and 14 officers of the Veterinary Corps recognized since August 5, 1917, makes a total of 195 officers of the Medical Corps, 48 officers of the Dental Corps, and 24 officers of the Veterinary Corps, National Guard, now in the medical departments of the several states, the majority of whom have been assigned to the National Guard organizations organized and recognized subsequent to August 5, 1917.

ENLISTED PERSONNEL, SANITARY UNITS AND DETACHMENTS

There were drafted into the Federal service for duty with the several National Guard divisions, 59 field hospitals and 47 ambulance companies, the total personnel for which was 520 officers and 10,506 enlisted men.

The total strength of the personnel for the various sanitary detachments assigned to line organizations numbered 972 officers (including dentists and veterinarians) and 6,119 enlisted men.

The foregoing figures showing the strength of personnel are taken from the report of the Adjutant General of the Army. (See Appendix C.) The table shows 99 officers of the Medical Department less than shown by the records of this bureau. The difference can be accounted for by the fact that in numerous instances the dentists and veterinarians assigned to organizations were not included in the reported strength of line organizations.

SEPARATIONS FROM FEDERAL SERVICE AND CAUSES THEREFOR

There appears below a statement showing the total number of officers of the National Guard, including the Medical Department, who were separated from the federal service, by grades, with the causes therefor, and Appendix E gives a tabulation of those so separated by states.

During the period covered by the report, 147 officers of the Medical Department were separated from the federal service. The grades and causes for the separation of those so affected are as follows:

Causes	Grade					
	Medical Corps			Dental Corps	Veterinary Corps	Total
	Major	Captain	First lieutenant	First lieutenant	Second lieutenant	
Physical disability	10	7	32	9	1	59
Resignation	7	8	42	5	5	67
Efficiency boards	6	1	14	.....	.....	21
Total	23	16	88	14	6	147

Included in this table are: Resignations for the good of the service: Medical Corps, 1; Dental Corps, 1. Discharged by sentence of court-martial: Medical Corps, captain, 1; lieutenants, 2; Dental and Veterinary Corps, none.

The total number of officers of the National Guard, including those of the Medical Department, who were discharged from the service of the United States during the period covered by this report on account of physical unfitness is 511. The physical disabilities for which they were discharged and the number so involved are as follows:

Abscess about rectum	1	Constipation	1
Age	5	Defective dentition	6
Age, premature	1	Defective hearing	22
Albuminuria (no diagnosis)	4	Defective mental development	1
Ankylosis (joints not stated)	3	Defective vision	46
Arterial hypertension	17	Diabetes mellitus	7
Arteriosclerosis	14	Drug habit, heroin	1
Astigmatism	1	Drug habit, morphin	4
Asthma	4	Duodenum, ulcer of	2
Arthritis	10	Epilepsy	3
Arthritis, gonorrheal	1	Endocarditis, chronic	3
Bronchitis, chronic	2	Empyema	1
Central cerebral degeneration	1	Familial tremors	1
Choroiditis	1	Feet, deformity of	1
Cholecystitis	1	Feet, weakness of	1
Colic, renal	1	Flatfoot	26
Colitis	1	Finger and thumb, loss of	1
Colon, chronic dilation of	1	Fracture, old, of leg with shortening	2
Color blindness, red and green	3	Fracture, gunshot of foot	1

Fracture, old	3	Paralysis anterior tibial nerve	1
Gastric neurosis	1	Paresis	1
Gastritis, chronic catarrhal	1	Pericarditis	1
Glaucoma	1	Pleurisy, chronic fibrinous	2
Glycosuria	2	Poor general condition	3
Goiter, exophthalmic	2	Psychasthenia	9
Goiter, simple	2	Psychosis, maniac depressive	1
Gonorrheal urethritis, chronic	1	Psychosis, organic brain disease	1
Hand, deformity of	1	Pulmonary emphysema	1
Headache	1	Pyorrhea alveolaris	6
Heart, unmentioned diseases of	1	Rheumatism, articular chronic	1
Hemorrhoids	2	Rheumatism, chronic	3
Hernia, abdominal	2	Rheumatism, subacute	1
Hernia, inguinal	16	Scoliosis	2
Hernia, umbilical	1	Sinusitis of the antrum Highmorii	1
Hyperchlorhydria	1	Sprains, (joints not designated)	1
Joint, loose body in	1	Stomach, ulcer of	2
Kidney, ptosis of	1	Sympathetic nervous system, disturbance of	1
Knee, limitation of motion of left	1	Synovitis, nontraumatic	1
Knee, weakness following operation, left	1	Syphilis, secondary	1
Lesion lower spinal cord, with increased reflexes	1	Testis, undescended	1
Liver, cirrhosis of	1	Trachoma	1
Locomotor ataxia	3	Tuberculosis of hip	1
Lung, collapsed right	1	Tuberculosis of pleura	1
Lung, fibroid of	1	Tuberculosis of testis	1
Myopia	3	Tuberculosis, pulmonary, acute	2
Myocarditis, acute	1	Tuberculosis, pulmonary, chronic	35
Myocarditis, chronic	5	Tuberculosis of vertebrae	2
Metatarsalgia	1	Twitching of muscles of face, eyes, and neck	1
Nephritis, acute	1	Underweight	3
Nephritis, chronic interstitial	20	Under development	2
Nephrolithiasis	1	Varices	1
Neurasthenia	13	Valvular heart disease	87
Obesity	8	Varicose veins	4
Oesophageal spasm	1	Vasomotor instability	2
Orchitis, nonvenereal	1	Weak herniotomy scar	1
Otitis media	6	Unclassified	10
Pain right knee and tibia	1		
Pansinusitis	1	Total	511
Paralysis agitans	1		
Paralysis circumflex nerve	1	Per cent	4.30

Appendix F shows, by states, the number of National Guard who were rejected on account of physical unfitness upon induction into federal service on August 5 and prior thereto on account of call and draft in 1917 and in 1918, and the causes for same. The data furnished by this table are very interesting when compared with similar data shown in previous annual report of this bureau, in that it shows a marked decrease in the number of National Guard rejected on account of physical unfituess in the 1917 mobilization as against the 1916 mobilization of this force. Following is a statement showing this comparison for the more important causes for rejection in the few states where this was possible from the data on file for 1916 and 1917:

States	Diseases													
	Defective vision and diseases of the eyes		Flat foot		Hernia		Heart		Lungs		Poor physique		Venereal	
	1916	1917	1916	1917	1916	1917	1916	1917	1916	1917	1916	1917	1916	1917
Connecticut	22.02	.....	5.79	3.28	1.51	0.35	14.17	0.62	3.79	....	19.14	0.27	6.80	0.85
New Jersey	3.76	3.53	8.00	3.95	8.70	4.46	14.11	2.41	18.23	4.99	45.10	4.64	2.58	3.36
New York	24.44	16.32	[1]8.12	[1]30.17	7.69	12.84	[2]10.16	[2]1.34	....	....	30.54	16.63	3.38	12.51
North Carolina	70.71	2.72	[1]4.35	[1]3.41	4.90	2.79	7.19	3.34	2.74	3.64	33.14	4.76	26.32	4.45
Ohio	10.42	.50	[1]8.14	[1]34.73	7.09	8.02	[2]15.43	[2]15.83	.....	....	33.07	4.72	5.94	4.64

[1] Flat foot and deformities. [2] Combined percentage for heart and lungs.

The percentage of rejections for physical unfitness for the 1917 mobilization, as given in last annual report (9.9 per cent), was based on the available incomplete returns from department commanders at date of publication of the report. More complete and accurate data received since the last annual report shows the percentage of rejections in 1917 mobilization to be 7.16 per cent of the 261,654 men examined against 18.45 per cent of the 128,517 men examined for the 1916 mobilization. Data for making this comparison was not available for all the states. It was available only for the states of Connecticut, New ersey, New York, North Carolina, and Ohio.

The foregoing is of interest as being perhaps an indication of the thoroughness or lack of thoroughness with which examining surgeons of the National Guard organizations did their work prior to the muster in of 1916 and during the period the National Guard was out of Federal service between the mobilizations of 1916 and 1917.

Thus the marked difference in rejection percentage for defective vision and diseases of the eyes, for cardiac and pulmonary conditions, and for poor physique at the muster in of 1916 and that of 1917 in certain of the states, notably Connecticut, North Carolina and Ohio, might justify the inference that examinations had been carelessly made prior to the 1916 muster in or that the rejection requirements for these disabilities had been disregarded at the time of examination for enlistment.

Most of the states show a decided decrease in the rejection percentage at the 1917 muster in for practically all causes, which may perhaps be assumed to indicate that the work of excluding unfit applicants for enlistment had been carefully done in the period between the muster in of 1916 and that of 1917. But there are notable exceptions. New York had to reject 30.17 per cent for flat foot and foot deformities, 12.84 per cent for hernia, and 12.51 per cent for venereal diseases at the 1917 muster, as compared with 8.12 per cent flat foot and foot deformities, 7.69 per cent for hernia, and 3.38 per cent for venereal diseases at the 1916 examination. Ohio rejected 34.73 per cent for flat foot and foot deformities in 1917 as compared with 8.14 per cent for these causes in 1916.

LEGISLATION AFFECTING THE MEDICAL DEPARTMENT, NATIONAL GUARD

Under the law and regulations the organization, etc., of the Medical Department, National Guard, is the same as that prescribed for the Regular

Army. The act approved June 3, 1916, provided that first lieutenants, Medical Corps, after five years' service in this grade, were eligible, subject to examination, for promotion to the grade of captain, Medical Corps.

The foregoing-named act provided fo ran Officers' Reserve Corps, and further provided that at the expiration of one year from the approval of this act, the Medical Reserve Corps would cease to exist and all officers thereof who so elected would be recommissioned in the medical section of the Officers' Reserve Corps.

The law creating a reserve corps provided for appointment therein of persons from civil life who were found qualified therefor under regulations prescribed by the Secretary of War. Those found qualified could be appointed up to and including the grade of major.

As a result of the authorization of the Officers' Reserve Corps, a large number of civilian doctors made application and were appointed to the several grades authorized for this corps in the Regular Army. While the majority so appointed were given the grade of first lieutenant, a considerable number were commissioned in the grades of captain and major.

The requirements as to the eligibility of these civilian doctors for commission in this force consisted, for the most part, of determining their physical, mental, and professional qualifications by more or less rigid examinations, depending largely upon the judgment and recommendation of the officer or board designated to pass upon the applicants' qualifications.

No opportunity having been given, except in a limited number of cases, for the officers of this reserve force to make themselves reasonably proficient in their military duties in the grades to which they were appointed, it is obvious that many of those commissioned in the grades of captain and major had little or no knowledge of the military duties required of officers in those grades.

When the National Guard was mobilized in 1916 for duty on the Mexican border and most of the available Regular Army within the continental limits of the United States was also mobilized, it was necessary to call to active duty a large number of the Medical Reserve Corps, United States Army, to provide for the necessary medical requirements which could not be furnished by the Regular Medical Corps.

This resulted in bringing together officers of the Medical Corps, National Guard, and Medical Reserve Corps, United States Army. Many of the latter, with grades of captain and major, who were without military training and experience, having been commissioned in these grades from civil life, came in contact with medical officers of the National Guard of lower grades who were fairly well trained in their military duties, resulting in the observing National Guard medical officer drawing comparisons and wondering why such inexperienced and untrained reserve officers should outrank him, and, in many instances, be placed over him in important positions when he was better qualified by training, experience, and length of military service to fill the position.

This condition of affairs caused dissatisfaction and criticism on the part of some National Guard medical officers. Many resigned after the demobilization of the National Guard in 1916 and sought commissions in the Medical Reserve Corps in higher grades, which, on account of the laws governing the organization of the National Guard, they were denied until they had served

five years in the grade of first lieutenant to secure the grade of captain, and to secure the grade of major they must await a vacancy in that grade.

This discrimination, due to existing laws, was brought to the attention of members of Congress, and a bill was introduced by Mr. Dent, May 29, 1917, to amend section 60 of the National Defense Act, approved June 3, 1916, by inserting after the word "war" the following:

Provided, That during the existing emergency lieutenants in the Medical Corps of the National Guard shall be eligible to promotion as captain upon such examination as may be prescribed by the Secretary of War.

This bill was referred to this bureau for comment. The important indorsement thereon is quoted in full in Appendix S of this report. This bureau recommended "that during the period of the war, first lieutenants of the Medical Corps of the National Guard shall be eligible to promotion as captain upon such examination as may be prescribed by the Secretary of War."

The bill was amended to include first lieutenants, Medical Corps, United States Army, and passed the House unanimously in June, 1917. It was referred to the Senate, where it was amended to provide for a Dental Corps. The bill was approved October 6, 1917, and was published as Section V of Bulletin 61, War Department, October 23, 1917.

Although the act referred to was approved and became a law October 6, 1917, the regulations prescribing its enforcement were not published until December 29, 1917. They read as follows:

III. 1. The act of Congress approved October 6, 1917, entitled "An act to provide for the promotion of first lieutenants in the Regular Army and National Guard to the grade of captain, . . . and for other purposes," provides in part as follows:

"That during the existing emergency first lieutenants in the Medical Corps of the Regular Army and of the National Guard shall be eligible to promotion as captain upon such examination as may be prescribed by the Secretary of War.

"2. The following regulations thereunder are prescribed for the guidance of all concerned:

"(*a*) No first lieutenant of the Medical Corps shall be promoted to the grade of captain without examination.

"(*b*) No examination shall be had for the promotion of a first lieutenant under the foregoing law unless he shall, if an officer in the Medical Corps of the Regular Army, have completed one year's continuous service in that corps, or, if an officer in the National Guard, have completed one year's Federal service in the Medical Corps thereof since May 11, 1916.

"(*c*) At a suitable time anterior to the expiration of one year's service by any first lieutenant, as above, an examining board will be convened to conduct his examination. The rules and regulations governing the constitution, procedure, and action of examining boards for the promotion of medical officers prescribed in general orders or special regulations therefor, current at the time, will govern also the constitution, procedure, and action of the examining boards hereunder."

It was not contemplated in the act of October 6, 1917, that first lieutenants of the Medical Corps, Regular Army and National Guard, shall serve a fixed period in the military service in a lower grade before they are eligible for promotion to the grade of captain, Medical Corps. The object contemplated was to place officers of the Medical Corps of the Regular Army, Na-

tional Guard, and Reserve upon an equal footing as to promotion to the grade of captain.

The regulations prescribed that—

No examination shall be had for the promotion of a first lieutenant under the foregoing law unless he shall, if an officer in the Medical Corps of the Regular Army, have completed one year's continuous service in that corps or, if an officer in the Natinal Guard, have completed one year's federal service in the Medical Corps thereof since May 11, 1916.

While this bureau, in a memorandum to the Surgeon General, stated that, in so far as pertained to the National Guard, it was of the opinion that National Guard medical officers of six months' federal service should be considered eligible to take the prescribed examination; however, the one year requirement for both the Regular and National Guard medical officers placed them on an equal footing and greatly added to the probabilities of their becoming proficient in the duties required in the grade of captain, Medical Corps.

If similar requirements had been exacted of officers of the Medical Reserve Corps, United States Army, as were applied to the Regular Army and National Guard medical officers in the matter of appointments to grades higher than that of first lieutenant, Medical Corps, there could not have been any cause for complaint and the present discrimination would not exist. This, in the opinion of this bureau, was contemplated by an act approved October 6, 1917.

After this law was passed, it was only a matter of regulation to have placed all officers of the Medical Corps of the Regular Army, National Guard, and Reserve upon equal footing in the matter of promotion, thereby greatly increasing the efficiency of the entire Medical Department.

The act approved October 6, 1917, quoted above, provided that the Dental Corps, United States Army, "shall consist of commissioned officers of the same grade and proportionately distributed among such grades as are now or may be hereafter provided by law for the Medical Corps," etc. The application of this act resulted in immediately promoting a large number of officers of the dental corps to the grades of colonel, lieutenant colonel, major, and captain.

The Judge Advocate General was called upon for an opinion as to whether the foregoing law would apply to officers of the Dental Corps, National Guard, drafted into the federal serdvice. His reply was in the affirmative, and it was approved by the Secretary of War April 3, 1918.

The records of this bureau do not show that, up to the rendition of this report, the provisions of this act had been applied to the officers of the Dental Corps of the National Guard in federal service. The highest grade held by any officer of the Dental Corps, National Guard, is that of captain.

The act approved July 9, 1918, contains provisions which, while apparently not applicable to the officers of the Medical Corps, National Guard, yet act to further discriminate against nearly 1,200 of these officers who were drafted into federal service, most of whom are now on the battlefield of France doing their part along with the officers of the Regular Army and Medical Reserve Corps.

The extract of the act referred to reads as follows:

Increase in Medical Department: That the Medical Department of the Regular Army be, and is hereby, increased by one Assistant General, for service abroad during the present war, who shall have the rank of major general, and two Assistant Surgeons General, who shall have the rank of brigadier general, all of whom shall be appointed from the Medical Corps of the Regular Army.

That the President may nominate and appoint in the Medical Department of the National Army, by and with the advice and consent of the Senate, from the Medical Reserve Corps of the Regular Army not to exceed two major generals and four brigadier generals.

That the commissioned officers of the Medical Corps of the Regular Army, none of whom shall have rank above that of colonel, shall be proportionately distributed in the several grades as now provided by law.

That the commissioned officers of the Medical Reserve Corps of the Regular Army, none of whom shall have rank above that of colonel, shall be proportionately distributed in the several grades as now provided by law for the Medical Corps of the Regular Army: *Provided*, That nothing in this act shall be held or construed so as to discharge any officer of the Regular Army or deprive him of a commission which he now holds therein.

It would appear from the reading of the law that, if a strict interpretation were applied, officers of the Medical Corps, National Guard, drafted into federal service, of whom there are about 1,200, would be debarred from being commissioned in the grade of a general officer in the Medical Department; that while officers of the Medical Reserve Corps can be promoted to grades up to and including that of colonel in the same proportion as that authorized by law for the Regular Army Medical Corps, the 1,200, more or less, National Guard medical officers in federal service are not so eligible under the provisions of this act. The strict application of the foregoing law will result in promoting to the grades of colonel and lieutenant colonel about 800 or 1,000 officers of the Medical Reserve Corps, while promotions to these grades in the same proportion are denied National Guard medical officers and their promotions will be confined to vacancies in the grade of lieutenant colonel in divisional organizations, which, so far, have affected only about 25 former National Guard medical officers.

So far as this bureau is aware, there has not been a single medical officer of the National Guard in federal service appointed to the grade of colonel, Medical Corps, while a large number of Medical Reserve officers have been appointed to the grades of colonel and lieutenant colonel under the provisions of the act of May 18, 1917, which is equally applicable to medical officers of the National Guard drafted into federal service.

Many of the officers of the Medical Corps, National Guard, drafted into federal service, serving in the grades of major and lieutenant colonel, have had long prior military service, some in Cuba and some in the Philippine Islands; have taken advantage of every opportunity offered by the War Department, while officers of the National Guard, to make themselves proficient in their duties and have excellent efficiency records for service on the Texas border, as shown by inspection reports of National Guard organizations made by experienced officers of the Regular Army, all of which will count for nothing if there be a strict application made of the recent act of Congress quoted above.

In the opinion of this bureau it was not intended by Congress or the originator of the amendment enacted into law to discriminate against these twelve hundred former medical officers of the National Guard, the majority of whom are now doing their "bit" on the battle line alongside of their brothers in the medical profession from civil life and the Regular Army Medical Corps in their combined efforts to save the lives, restore to health, and return to duty those of our Army who are being wounded or maimed by a brutal and unmerciful foe, in our efforts to make this world fit to live in and safe for democracy.

It is hoped that those whose duty it is will see to it that this patriotic body of loyal American citizens and highly efficient medical officers are not discriminated against in the matter of promotions in the military service.

The foregoing statements will fully answer the numerous requests, official and otherwise, made of this bureau as to why the Medical Corps, National Guard, was being discriminated against in the matter of promotions to higher grades. Perhaps the strict application of General Orders, No. 73, War Department, 1917, will operate to remedy the discrimination referred to above.

PROMOTIONS

Under the provisions of the act approved October 6, 1917, and regulations prescribed thereunder, all first lieutenants, Medical Corps and Dental Corps, National Guard, who were drafted into the federal service August 5, 1917, should have been promoted to the grade of captain by August 5, 1918. Whether this has been accomplished is not a matter of record in this bureau. The statement below shows the number promoted in the Medical, Dental, and Veterinary Corps in the several grades up to and including May 10, 1918, as shown by the records of this bureau:

Grade	Medical corps	Dental corps	Veterinary corps	Total
Major to lieutenant colonel	13	.....	.....	13
Captain to major	38	.....	.....	38
First lieutenant to major	7	.....	.....	7
First lieutenant to captain	174	33	.....	207
Second lieutenant to first lieutenant	.....	.....	7	7
Second lieutenant to captain	.....	.....	4	4
Total	232	33	11	276

ASSIGNMENT OF MEDICAL OFFICERS TO NATIONAL GUARD DIVISIONS

Tables of organization under which National Guard divisions were organized prior to draft provided for one lieutenant colonel as division surgeon; one lieutenant colonel as sanitary officer; one major as assistant to division surgeon; one major as director of field hospitals, and one major as director of ambulance companies.

Three States (New York, Pennsylvania, and Ohio) had their required divisional organizations, including complete sanitary trains, in addition to their complete sanitary units and, with few exceptions, all required medical personnel. These were drafted into federal service as complete divisions.

The remaining National Guard divisions comprised two or more States, and the divisional staff and directors of field hospitals and ambulance companies were selected by this bureau from among those officers of the National Guard who from their efficiency records were best adapted to fill these vacancies.

For obvious reasons the War Department decided that the best interests of the service would be better safeguarded by assigning suitable medical officers from the Regular Army, in so far as they were available, as division surgeons of all National Guard divisions that had not their authorized divisional staffs.

Carrying out this policy, and after consultation with the Surgeon General's Office, this bureau was informed that 14 medical officers of the Regular Army in the grade of lieutenant colonel would be available for the remaining 14 divisions, and they were assigned as division surgeons. In so far as practicable, and wherever medical officers belonging to the state staff departments of known efficiency were available in the grades authorized, they were assigned to the positions of sanitary officer, assistant to division surgeon, and directors of field hospitals and ambulance companies. Where this could not be done, medical officers of known ability from the Regular Army were assigned to these positions.

It is a source of gratification to know that those selected from the National Guard were in the majority of cases satisfactory, and those so assigned proved proficient and performed their duties in an efficient manner.

Before all the medical officers assigned as sanitary inspectors could be promoted to the grade of lieutenant colonel, as authorized by Tables of Organization, the latter were changed and allowed only the grade of major for this position. This affected five medical officers.

When the National Guard divisions were reorganized under Tables of Organization of January, 1918, there was authorized an additional medical officer in the grade of lieutenant colonel as commander of sanitary trains. These vacancies were for the most part filled by promotion of qualified medical officers of the National Guard, so that the majority of all the responsible positions in the Medical Department, National Guard, were held by medical officers of the National Guard. Not more than 10 or 11 medical officers of the Regular Army were being utilized for the National Guard divisions when the reorganization was ultimately completed, which speaks well for the efficiency of the Medical Corps of the National Guard and compensates the War Department for its efforts in training them.

CAMPS OF INSTRUCTION

Upon request of this bureau 257 medical officers and 762 enlisted men of the Medical Department, National Guard, were called into federal service June 20, 1917, and sent to Medical Department training camps for a three months' course of instruction. These camps of instruction were located at Fort Benjamin Harrison, Ind., Fort Riley, Kans., and Fort Oglethorpe, Ga.

Those selected for attendance at these schools were for the most part without prior military training; so that when this personnel was returned to their organizations at their mobilization camps there was available a partially trained personnel that could be utilized to train and instruct those who were without military knowledge and training, and they were an

important factor in developing the efficiency of the Medical Department of the National Guard divisions.

HEALTH CONDITIONS OF NATIONAL GUARD MOBILIZATION CAMPS

This is a matter that will be fully covered in the report of the Surgeon General and cannot, for obvious reasons, be taken up in the report of this bureau.

In view of the fact that this report is intended for the information of the governors of all States, who may not have an opportunity to see the Surgeon General's report, and that naturally they would be interested in a brief statement showing the health conditions of the National Guard while in mobilization camps, there appear on page 31 two statements compiled from data on file in this bureau showing admission rate per thousand, noneffective rate, and maximum and minimum annual rates per thousand for National Guard and National Army camps for certain periods while in camp.

Week ending—	Noneffective rate, all causes		Admission rate per 1,000, diseases only	
	National Guard	National Army	National Guard	National Army
Oct. 19	23.5	17.0	952.6	1,014.0
26	26.1	18.7	1,056.8	900.4
Nov. 2	24.5	20.1	1,108.8	929.4
9	38.9	25.2	1,517.3	1,139.9
16	42.6	28.5	1,697.3	1,427.0
23	44.5	30.7	1,732.9	1,444.6
30	43.9	32.5	1,448.6	1,423.0
Dec. 7	45.8	36.0	1,847.5	1,774.8
14	48.6	40.4	1,757.7	1,887.5
21	47.8	41.8	1,621.8	1,786.6
28	46.6	41.2	1,247.8	1,465.8
Jan. 4	47.9	43.4	1,368.7	1,554.8
11	48.2	48.9	1,622.1	2,021.7
18	49.1	51.0	1,567.8	1,905.0
25	50.4	53.9	1,527.9	2,095.2
Feb. 1	49.6	55.7	1,562.3	2,070.2
8	48.5	59.5	1,548.2	2,081.7
15	48.1	59.4	1,424.9	1,901.8
22	44.8	58.6	1,192.5	1,835.9
Mar. 1	42.2	54.5	1,101.7	1,557.1
8	42.1	54.2	1,164.4	1,820.2
15	40.2	58.8	975.1	2,075.0
22	37.8	57.0	893.6	1,870.0
29	39.1	58.7	1,103.5	1,814.7
Apr. 5	41.4	54.3	1,478.3	1,943.7
12	27.8	55.7	1,232.2	1,959.4
19	46.8	54.2	2,053.0	1,724.0
Average	42.08	44.44	1,407.6	1,683.0

MAXIMUM AND MINIMUM ADMISSIONS, DISEASES ONLY—ANNUAL RATE PER 1,000, NATIONAL GUARD AND NATIONAL ARMY, FOR THE PERIOD FROM OCTOBER 19, 1917, TO APRIL 19, 1918.

Diseases	National Guard				National Army			
	Maximum	Date	Minimum	Date	Maximum	Date	Minimum	Date
Pneumonia	58.00	Dec. 7, 1917	8.2	Oct. 19, 1917	52.9	Apr. 12, 1918	9.7	Nov. 2, 1918
Dysentery	.9	Nov. 23, 1917	.....	Nov. 16, 1917	3.8	Jan. 15, 1918	.....	Nov. 16, 1917
Malaria	9.7	Oct. 26, 1917	.1	Feb. 15, 1918	8.1	Oct. 26, 1917	.....	Mar. 1,1918
Venereal	151.5	Nov. 9, 1917	39.4	Mar. 22, 1918	215.0	Apr. 5, 1918	54.4	Jan. 11, 1918
Paratyphoid	1.0	Nov. 16, 1917			.1	Nov. 30, 1917		
Typhoid	2.4	Dec. 7, 1917			1.9	Nov. 16, 1917		
Measles	539.9	Nov. 16, 1917	3.3	Mar. 29, 1918	265.5	Dec. 14, 1918	11.5	Oct. 19, 1917
Meningitis	5.4	Dec. 7, 1917	.4	Nov. 2, 1917	8.3	Dec. 21, 1917	.6	Oct. 19, 1917
Scarlet fever	17.6	Jan. 18, 1918	.1	Oct. 26, 1917	18.4	Feb. 8, 1918	.1	Oct. 19, 1917

The same data are given for National Army troops, as they, like the National Guard, were temporary forces serving under similar conditions, except that the National Army troops were housed in cantonments while the National Guard were housed under canvas.

The data indicate a low sick and noneffective rate, and that for the National Guard compares very favorably with that for the National Army. The records show that the Twenty-seventh, Twenty-eighth, and Thirty-seventh Divisions, National Guard, stood among the first of all divisions as having low sick and mortality rates.

EFFECTS OF LEGGINGS AND PUTTEES ON THE FEET AND LEGS OF THE SOLDIER[1]

It has been alleged by certain army officers that the leggings and puttees worn by the officers and soldiers in the United States Army constitute a serious menace to the foot health of the wearers, in many instances actually disabling the men and greatly impairing their efficiency. Careful consideration of this subject reveals a problem that presents numerous elements for error in deduction. Foot and leg clothing is not a simple proposition, and its utility and healthfulness have received very extensive consideration. Frequently, however, trouble arising from one source is wrongly referred to another, and this thought is in mind in this analysis.

During the past year I have personally examined the feet and legs of about 30,000 officers and men for diagnosis, detection of potential weakness and treatment of actual disabilities. I have been impressed with the number of factors concerned in the health of the feet and of the legs below the knees. The shoes and socks

[1] With two illustrations.

have been quite thoroughly discussed by many different writers and from many different views and will not be considered here. Of the other coverings which influence foot health, there are to be considered: (1) the drawer cuff, (2) cuff of sock, (3) garter, (4) lacing, (5) breeches cuff, and (6) legging or puttee.

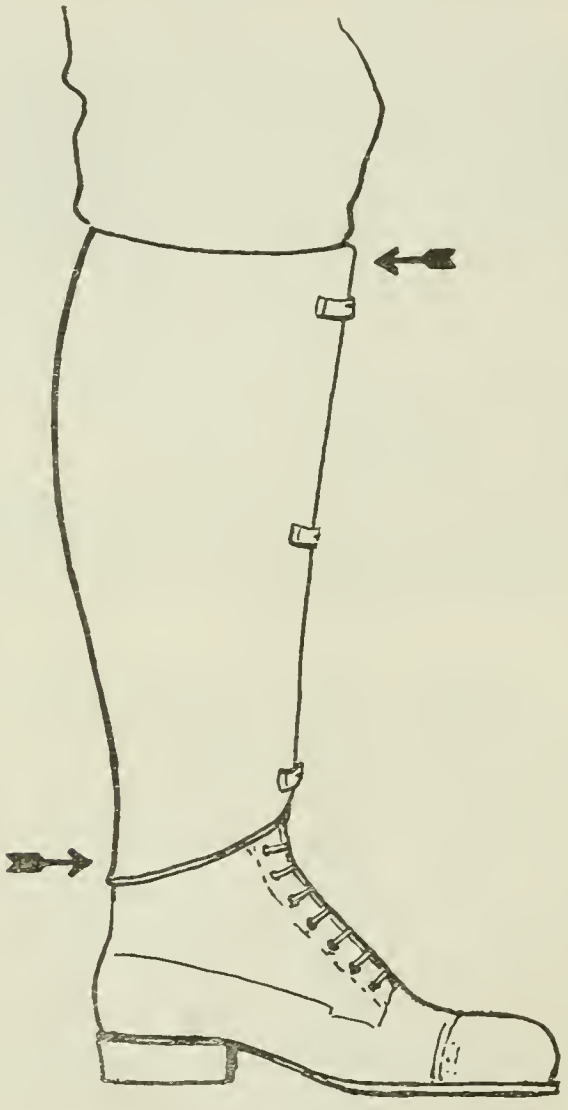


Fig. 1.—Showing the two points of pressure as commonly seen.

1. The cuff on the lower end of the leg of the drawers is knitted and is tighter than the drawer itself. This comes ordinarily just about the middle of the lower leg. Constriction of the leg by this cuff, though superficial, will, if maintained, cause discomfort, congestion and swelling, and more or less disturbance of the circulation. As a matter of fact, while recognizing the existence of these possibilities, I have never seen any that could be traced directly to this cause.

2. The sock. After a sock has been worn for awhile the top becomes stretched. If this part is not carefully smoothed out on the leg, it becomes rolled downward and these wrinkles will be pressed into the skin of the leg. These pressure imprints cause distinct discomfort and are fairly frequently observed. They are easily obviated by a little care in dressing. The top of the sock should be placed over the cuff of the drawer, but if it has become greatly stretched it should be drawn over the cuff of the breeches after this has been laced in place.

3. Garters are not regulation, but I have been surprised at the number of officers and enlisted men who wear them. Almost all are of the type which clamps about the top of the calf muscles and of necessity makes pressure on the superficial veins. This venous obstruction causes a tired and dead ache in the feet and legs and produces in time varicose veins, which are both disabling and disqualifying. I have seen a number of such cases, and any or all of them could easily have been ascribed to the leggings. Garters should be strictly forbidden to both officers and men.

4. The manner of lacing the cuff of the trousers may be productive of local disturbances. Usually this part of the trouser fits the calf of the leg snugly, and the lacing is drawn sufficiently taut to make the covering entirely smooth. The laces are usually about a yard long and, after being drawn taut, there remain one or two long ends. They are passed around the leg once or twice and then tied. This is an improper method, and two things are to be avoided; one is wrapping the lacing about the leg, the other tying a heavy knot on the front of the leg, especially over the front of the shin bone (tibia). The vent in the trouser cuff is intended to lie a little to the outer side of the leg. After the laces have been tightened, it is much better to run the long end or ends up and down to the fourth or fifth cross-lace and then tie as far to the outer side of the vent as possible. I have seen deep grooves in the leg and over the shin from pressure of the lacing and knot. The loop of the lacing is certain to slip downward and tighten about the leg where there is only the thickness of the sock, and in this area one sees most frequently the deep impression of the string. I saw one case of tenosynovitis of the anterior tendons (extensors) of the foot caused by the pressure of the string-ends, which had fallen down under the shoe top. The officer himself explained to me how it had occurred. A little care and instruction will prove of great value in protecting the soldier against trouble from the

lacing. It must not be drawn tight enough to interfere with the free action of the calf muscles or with the normal circulation in the veins and lymphatics.

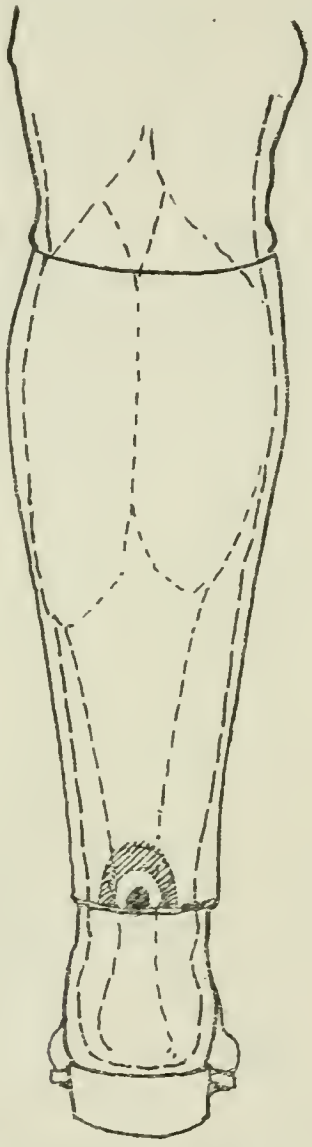


FIG. 2.—Showing sore on heel tendon and horse-shoe pad placed about it on the inside of the legging.

5. The cuff of the trousers must be wide enough after it has been laced to permit free use of the leg muscles. The lower end must not constrict the leg when the lacing is completed. One sometimes sees this condition which causes symptoms similar to the garter and tight drawer-cuff. These five factors will produce their effects in the middle or upper half of the lower leg, and each one may prove sufficient of itself to cause disability in the foot or leg. Again, several of them may be co-active, one aggravating the

other. There are, at this part, three layers of clothing—drawer, sock and trousers—and any or all of them may readily produce constriction to an uncomfortable or disabling degree.

6. The legging or puttee is the last factor, and the type has much to do with the potentiality for injury. There are mainly three forms, leather, canvas and woven (spiral), and these in turn are subdivided. The leather is chiefly of two types, (*a*) those fastening with straps and buckles and (*b*) those (Cordovan) fastened with a metal slide-clasp at the lower end and a strap and buckle at the top. The first of these is more flexible, adaptable and yielding by reason of its fastenings. The second is fixed, inflexible and unyielding by reason of the metal catch at the lower end. Any type of legging produces a certain amount of discomfort until it becomes adapted and adjusted to the leg, but if it has been properly fitted this process is but a matter of a few days. The proper fitting of a leather legging is extremely important, as the more nearly it conforms to the shape of the leg the more comfortable it will be. Two things are desired in the fitting: neatness and comfort. The first is secured by the selection of a type conforming to the shape of the leg. One courts trouble by trying to camouflage. The second is obtained by guarding against a tight and close fit. This is especially true of those which are fastened by the steel slide clip at the lower end. The only cases of inflamed heel tendons I have seen arising from legging pressure have followed one fitted too tightly, or, more frequently, the unyielding clasp-fastened type. This form should always be fitted more loosely than the other. Where this inflammation occurs the fastening must be loosed and the tendon protected by pads of felt placed on each side of the tendon and above the painful area. (Figs. 1 and 2.) The canvas legging is made in two types; one comes much lower on the shoe and has a strap passing under the sole of the shoe to retain it in place, while the other is the simple cuff legging running to just below the shoe top. There is much greater flexibility in these than in those of leather, and by reason of the arrangement of the eyelets they can only be laced to bring the two edges together. Care must be had that, when thus laced, the legging does not cause compression. The lower part naturally fits more loosely than the upper because of the lesser thickness of clothing underneath, but compression above is much more likely by reason of the three layers of clothing. The spiral puttees afford an even pressure on the leg from the ankle upward if properly applied, and, if there is any tendency to

varicose veins or relaxed circulation, they will afford a degree of comfort that no other form possibly can.

However, such cases are disqualified for line service, and the muscle constriction by the bandage will aggravate the inefficiency. The spiral puttee also tends to shrink when it becomes wet, and this will increase its pressure. This, in cold weather or under severe conditions, would prove injurious.

Conclusions

1. The types and varieties of coverings on the lower leg of the soldier may lead to error in diagnosing the cause of a foot or leg disability.

2. In the examination of 30,000 men in various ranks, the only disabling affection which could be traced to the leggings resulted from misfit.

3. The leggings must be fitted as carefully as the rest of the clothing and with as much intelligence as with the shoes.

4. They must not be tight enough to constrict.

5. If of uniform snugness, no harm will result from the legging beyond the lessening of freedom of the muscle action.

6. When the leggings are properly fitted, any disability present is caused by some other structure.

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CURRENT LITERATURE

A Clinical Study of Some Functional Disorders of the Heart Which Occur in Soldiers, by I. E. MacIlwaine, B.Sc., M.D., D. P. H. *Jour. Royal Army Med. Corps*, vol. xxx, No. 4, April, 1918, pp. 357–377.

A paper of general as well as special interest, calculated to improve our understanding and the scope of our inquiries of the term "functional." The author admits frankly that the term "functional disorders" is a wide and vague one, but that he prefers it to one still worse, namely: D. A. H. (disordered action of the heart), used in the army. Of this "pseudo-diagnosis," the author states that experience has shown him that it can be stretched so "as to include almost any medical ailment." The term certainly covers a deal of unconfessed ignorance, as we all must have felt long since. To place, as the author has attempted to do, the elementary factors in the syndrome of the trouble on an organic or chemical basis, is an aim well justified by long experience and one worthy of the best talents.

The term *functional disorder* denotes an absence of any known pathological basis for the condition which was so aptly described by Da Costa as "Irritable Heart," and by Sir James MacKenzie in his paper, "Soldier's Heart." While admitting that, on active service, the question most constantly before the medical officer is that of "fitness" or "unfitness" for service, he states that the problem differs when the men are examined at a base overseas, where the prognosis has to be formed as to the soldier's prospect of returning to duty and an estimate made of the probable duration of the treatment it will require to render him fit. The author's experience in dealing with over 3,000 cases at the base overseas had taught him that a single thorough clinical examination of a soldier suffering from cardiac symptoms was sufficient to enable him to form a prognosis of his prospects of future fitness and thus to dispose immediately of, roughly speaking, one-third of the 3,000 men. In the *remainder of the men* clinical examination failed to detect any "organic" disease which could be held responsible for the cardiac signs and symptoms present.

Since it was clearly impossible to base an opinion of any value on a single examination in such men, a so-called "effort test" was interposed between such an examination and the rendering of an answer to the question as to the soldier's disposal either for *active service,* or *duty at the base,* or *evacuation to England.* This test consisted in submitting these doubtful cases to a course of graduated physical drill of six weeks' duration. At the end of three weeks each man was reëxamined clinically and either disposed of or told to continue the course. On the termination of the course, a final examination, known amongst the men as "strafe," was made and his fate decided: "Active or Base." By

this practical method of treatment about half the men could be classified as fit for another period of active service; the other half got suitable work at the base.

A few of the men, having developed conditions of a nature to render their disposal by evacuation to England advisable, were sent home.

Thus, whilst a scheme had been evolved for dealing with the D. A. H. problem at a base overseas, the author still felt as if "defeated by the question from a scientific medical point of view." It now remained for the author properly to interpret the symptoms more scientifically in order to add weight and value to the conclusions he had deduced from his observations.

He first draws a picture showing the actual incapacity from which the soldier suffers and in which the predominatingly fundamental factor is that "*the soldier fails to endure a moderate amount of effort without fainting or collapse;*" that, further, "he may be unable to resist exhibiting similar symptoms when under stress of even moderate emotion," the man giving usually a history about as follows: "I am all right if I go slow, but if I have to try to march with the pack, after I have gone, say half a mile, or on the first hill, I begin to feel my heart thumping. Then I get a stabbing pain at the heart, I have a choking sensation in the throat, my eyes get mazy, I feel dizzy, and, if I go on, I stagger and then I fall." The author's interest has often been aroused in noting how often some of these men carried on in spite of symptoms: for months they would get into and out of their trenches by taking their time and resting on the way; or falling out on the hill, and, after a short rest, finishing their march. Their symptoms in this fainting condition, the author states, consisted in hurried respiration, profuse sweating and tachycardia.

Our author, after a careful and searching examination of all the various factors accompanying these functional cardiac disorders, comes to the conclusion that they will have to be diagnosed as *neurasthenia;* "possibly two-thirds of all these men might be described as *cardiac neurasthenics.*"

It is both interesting and instructive to follow the author in his attempts to establish his theory as to neurasthenia being a fundamental factor in connection with these functional disorders, while regretting at the same time having to limit ourselves here briefly to the main points: "I think today that we have reached a point in clinical medicine when it becomes necessary to recognize more fully the functions of the involuntary system. I have endeavored to make it clear that . . . in this *irritable heart condition* there is a psychological element and an associated neurasthenic state. There is a removal of the ordinary inhibition which prevents a man letting it be obvious that he is not going up the line if he can help it; . . . on the other hand, the man insists, in spite of an incapacity, obvious to himself, to return

to duty, . . . evidently signs of a lowered threshold of psychological stimulation. In other words, we observe that the reaction of the man to mental and mechanical stimuli is excessive."

The involuntary neuro-muscular mechanism, certainly, is a reflex system in the widest sense of the term and, naturally, such a working mechanism must, like other mechanisms and systems of organs, be subject and liable to fatigue and exhaustion. The author states that a closer study by himself of the involuntary nervous system, elaborated by Gaskell, led him to find still more reasons for assuming the existence of a neurasthenic state, induced by a lowered threshold of reflex excitability in the cardio-vascular, the respiratory and the alimentary systems. Now the main parts of this system, as described by Gaskell many years since, are: "(1) the cranial portion, mainly consisting of fibers of the vagus carrying involuntary impulses to the heart, lungs, stomach and small intestine (cranial outflow); (2) the thoraco-lumbar portion (the so-called sympathetic nervous system), which is the path of the nervous supply to the heart, the blood vessels all over the body, the sphincter system of the intestine and bladder, the involuntary muscles of the skin connected with the hair and sweat glands, etc.; (3) the pelvic portion which is mainly concerned with the involuntary impulses going to the large intestine, bladder and the organs of generation." It would, therefore, seem almost self-evident that the knowledge we possess of the intricate reflex mechanisms which are beyond our control must be drawn upon and be made to come to our aid in the solution of the problem of the etiology of functional disorders (physiological basis)! The author further, and incidentally, calls attention to Cannon's findings, namely, the presence of an increased amount of adrenal secretion in the blood due to the stimulation of the involuntary nervous system (clinical basis), although the last word has not as yet been said on the latter subject.

It is pertinent and perhaps not superfluous to quote what the author says of some of the reflexes: "Never having heard of anyone being able to produce a condition of goose-skin—a pilo motor reflex—or by volition to produce secretion, or develop cyanosis of the extremities, etc., any exaltation of these involuntary reflexes is as indicative of an alteration in the nervous mechanism of the body as any other evidence that can be produced, and the fact that they are involuntary enhances their value as evidence when the question of simulation arises."

The above, in brief, is the kernel in the author's argument, his object being not so much to discuss the general etiology of neurasthenia as to present a picture of a neurasthenic state in which the psychic and the psychomotor disturbances may be overshadowed by changes in the involuntary mechanisms and to put forward points seeming to throw new light on the genesis of this very interesting condition.

Etiology.—In his endeavors to trace the etiological factors giving rise to the sympton complex of cardiac irritability, the author takes the

view that "the condition is the result of a state of "irritable weakness" of the involuntary neuro-muscular mechanism in association with a similar state of psycho-motor and psychic systems. In one word, neurasthenia.

Emotion.—Under this head, as an example of the influence of mind over the body, the author cites excessive secretion of the adrenals and refers to the elaborate technique of Crile for minimizing the effects of psychic shock during a surgical operation. The stimulus of emotion in healthy civil life is reduced to a minimum; under conditions of active service in modern warfare such stimuli must be enormous. Discipline is a controlling element. "A further difficulty is encountered if we are asked to say whether this low threshold of stimulation is the normal healthy reaction of the individual, or whether increased emotional response is evidence of a diseased state of nervous mechanism. . . . The old physiological law—the summation of stimuli producing a maximum of response—operates on the normal as well as the poisoned nervous system."

Infection.—Although at present unable to bring forward any direct evidence that the functional condition "Irritable Heart" is due to chronic infection, the author is of the opinion that bacterial toxine may form a possible factor in the syndrome. He points out that similar symptoms occur in patients after passing through an infection. While they pass off readily in the majority of people, they persist in some, and the possible effect of such toxins on the dendrites and their synapse mechanism, according to the author, "is an alluring assumption in the light of nervous integration."

The author points to MacKenzie's conception of the lifelong infectivity of the rheumatic virus with its gradual destruction of cardiac efficiency as a prototype of many chronic infective conditions, against which the body is only able to establish a temporary immunity. While, as the author remarks, it has not been customary to associate functional cardiac disease with rheumatic infection, a very fair proportion of the men suffering from the functional disturbances under discussion had previously had attacks of rheumatic fever. There is certainly much wholesome food for further thought and investigation in these words of our author. And, when it is remembered that even a most careful examination failed to reveal the presence of any organic heart disease, it would only be common sense to look for some other source of circulatory inefficiency than the heart.

Trauma.—"Clinically, the picture of the soldier, in whom the diagnosis of traumatic neurasthenia is as correct as that of 'Irritable Heart,' resembles very closely some of the cases seen in civil practice after accidents."

The reviewer regrets being obliged to omit the detailed analysis by the author of the many symptoms encountered in the disease under discussion and the seemingly sound arguments which he brings to bear

in favor of his views as regards their etiology. Nevertheless, a few remarks regarding these, picked out at random, must be added in order to round out the impression which this abstract is intended to leave on the reader.

Thus, under *Dyspnea,* the author, referring to the interesting work done by Lewis, Barcroft and others, assisted by T. H. Milroy, on the electrometric method of estimating minute variations in the reactions of blood, as expressed in free hydrogen ion concentration or the absolute acidity, reminds us of the fact that the respiratory stimulus to increased breathing shows a correlative increase in absolute acidity of the blood, due to the presence in it of an increased amount of CO_2. In other words, the normal result of effort is attended by a production of slight acidosis and a correlative reduction of blood alkalinity which, together, form the efficient stimulus for an increased respiratory effort. In referring these physiological findings to the "soldier's heart" and assuming, as the author seems to do, the existence, in overworked soldiers, of a diminution of reserve alkali in the blood, their dyspnea out of proportion to the effort exerted, is due to the fact that the blood in such men "is more easily acidified by the action of CO_2 than the blood of a normal person." In the words of the author, we have here "a chemical explanation of the intolerance of the neurasthenic to the normal intoxication which effort produces."

Interesting in connection with the subject, though perhaps seemingly elementary to some of us, are the remarks the author makes under *Signs*: "In a healthy state the circulation is maintained by a correct balancing of force of heart muscle, size of the arterial reservoir, and pressure in this reservoir. This balancing is accomplished by the involuntary nervous mechanism through the apparently opposing actions of the vagus (the cranial outflow) and the accelerator sympathetic (the thoraco-lumbar outflow.) The efficiency of the circulatory apparatus, therefore, depends upon correct coördination of these *involuntary* impulses, just as all our voluntary muscular actions depend on the proper coördination of the *voluntary* nervous impulses to opposing muscles." It is these fundamental points that the author never deviates from in his efforts to explain to his audience the various cardiac signs. and especially the fact that failure of the circulation may be simply a failure of nervous coördination and not, necessarily, an incompetence of the heart muscle, a large number (3,000) of X-ray examinations having furnished him with sufficient clinical evidence "that the presence of a normal heart muscle was overwhelming."

Treatment.—While the remarks of the author under this head are most interesting, they only sum up the points already gone over in the first portion of this abstract and must be omitted in order not to overtax the patience of readers of abstracts. Under the head of *Prognosis* we may be permitted to quote just one more sentence for a closing citation: "I went abroad armed with an electrocardiograph and the con-

viction that the 'irritible heart condition' was a manifestation of cardiac disease, and I have come back obsessed with the idea that the syndrome is merely part of a general nervous disorganization which we have designated *neurasthenia*." H. G. Beyer.

The Susceptibility of the Antiscorbutic Principle to Alkalinity, by A. Harden, D.Sc., F.R.S., and S. S. Zilva, M.Sc., Ph.D. *The Lancet*, September, 1918, pp. 320.

The few experiments which the authors publish and which, they state, form but a part of an inquiry in which they are at present engaged, have revealed the important fact of the extreme susceptibility of the antiscorbutic principle to alkalies. For the purpose of testing the antiscorbutic potency of a substance, guinea-pigs were used, on account of the well-known and well-established fact that these animals, when kept on a diet of oats, bran and autoclaved milk, succumb to scurvy within a period of three to four weeks, while they remain in good condition with an addition to such a diet of 3 to 5 c.c. of freshly expressed orange juice, known to contain antiscorbutic principles.

The authors began by administering daily doses of 3, 5 and 7 c.c. of orange juice, *made neutral to phenolphthalein*, respectively, to three guinea-pigs, which were being kept on a scorbutic diet. All these animals did well for seventy-eight days, and, after being chloroformed, no scurvy was observed on post-mortem examination. "When, however, the orange juice was made N/20 alkaline with NaOH and stored for twenty-four hours in the cold room, before administration, daily doses of 3, 5 and 7 c.c. did not prevent or delay the onset of scurvy." This important discovery would point to the existence of a chemical, in addition to the already well-known physical (heat) agent with destructive attributes towards antiscorbutic substances. This result is not due to the effect of the alkali on the animals, for when the N/20 alkaline orange juice, after having been stored for twenty-four hours, was made N/20 with HCl before being given to the animals, the effect still persisted." Daily doses of orange juice, so treated, neither prevented nor delayed the onset of scurvy. Even a much less drastic treatment of the orange juice with only an N/50 solution of NaOH proved fatal to the antiscorbutic factor!

The practical applications of the principle involved would seem obvious. At a time, with winter before us, when fruits will be scarce and expensive, and when most antiscorbutic vegetables usually undergo a process of cooking, any culinary manipulation entailing alkaline treatment, in addition to cooking, would complete the destruction of antiscorbutic substances in our diet. It should be kept in mind that most antiscorbutic vegetables are either neutral or slightly acid and should be kept so to remain effective. The lay public should be made familiar with this part by those interested in dietetics and responsible for the proper nutrition of the people. H. G. Beyer.

BOOK REVIEWS

Principles and Practice of Filling Teeth, by C. N. Johnson, M.A., L.D.S., D.D.S., Chicago, Ill. Fourth Edition, revised and enlarged. Philadelphia: P. Blakiston's Son & Company. Price, $3.

This volume contains much more information than is usually found in more pretentious works of its kind, and should prove of much value to the busy dentist, giving him the meat of the various subjects treated in the clean-cut and definite style of the author.

The chapter on "Deposits on the Teeth" includes also the important subject "Oral Prophylaxis." The author lays particular stress on the duty of the dentist in instructing his patients in the manner of keeping their teeth clean and of the importance of a clean mouth in relation to general health.

The subject of Dental Caries and the proper examination for dental caries is well presented.

The fifth chapter on "Classification and Preparation of Cavities" goes carefully into the subject and is one of the most interesting parts of the volume.

The various filling materials are considered in a comprehensive manner. Their relative value in the preservation of the teeth and the proper manipulation to bring about the best results in their use is insisted upon.

The chapter on "Root Canal Work" has been rewritten and brought up to date. The chapter on "the X-Ray in the Management of Pulpless Teeth" is timely and gives emphasis to the necessity for the coöperation of the physician, the dentist and the radiographer in determining the condition of the affected teeth, leading either to conscientious efforts being made towards their safe retention or to their legitimate extraction.

Another very interesting chapter is that on the "Management of Children's Teeth."

The volume is well illustrated and of convenient size.

C. Victor Vignes.

The Surgery of Oral Diseases and Malformations—Their Diagnosis and Treatment, by George Van Ingen Brown, D.D.S., M.D., C.M., F.A.C.S., Major, Medical Officers' Reserve Corps, U. S. Army; Oral Surgeon to St. Mary's Hospital and to The Children's Free Hospital and Columbia Hospital, Milwaukee; Fellow of the American Medical Association; Member of the National Dental Association; Chairman of the Section Oral Surgery of the Fourth International Dental Congress, Etc. With 570 engravings and 20 plates, and a selected list of examination questions. Philadelphia and New York: Lea & Febeger, 1918.

The most important changes in this, the third edition of this work, as stated by the author, are to be found in the chapter relating to War Surgery. The explanation given is that the book was almost entirely rewritten at the time this second edition was published, approximately one year before the third edition. The arrangement of the order in which the chapters are presented, the headings of the subdivisions of each chapter and the selected

line of examination questions, with page references, are particularly designed for text-book purposes. This plan is advantageous to both teacher and student. The large number and the character of the illustrations are so designed as to give full presentation of the clinical side of each subject. It would seem, however, that additional drawings delineating more specifically the operative steps in much of the reconstructive plastic surgery, clinical examples of which are shown by photographs, would be an advantageous improvement. Although each edition has been given to differentiate diagnosis of all the affections described—and this is particularly true of diseases of the nervous system in their buccal relation—it would nevertheless have been advantageous if the differential diagnosis of diseases and surgical lesions occurring in the tissues of the neck above the clavicle could have been more elaborately treated, inasmuch as war lesions have called particular attention to the importance of this subject. The description and full illustrations of the methods of local anesthesia, nerve blocking, etc., might have been improved by more stress being laid on the necessity for the preparation of aseptic solutions. The use of stills, which are now so generally used, should have been urged.

The chapter on the treatment of Wounds under War Conditions gives the best presentation of the methods employed in French, German, English and American hospitals, and until such time as all this work may be completed and the results reported in a systematic manner, it is impossible to do more than give a general idea of the methods employed and the important principle. This the author has done in a satisfactory manner. The work is entitled to the careful consideration of all oral and general surgeons, because it compares favorably with the most authoritative works on the various subjects discussed.

W. H. G. Logan.

Local and Regional Anesthesia, by Carroll W. Allen, M.D., Assistant Professor of Clinical Surgery at the Tulane University of Louisiana, New Orleans; Lecturer and Instructor in Genito-urinary and Rectal Diseases at the New Orleans Polyclinic; Visiting Surgeon to the Charity Hospital. Introduction by Rudolph Matas, M.D. Second edition, reset. Philadelphia and London: W. B. Saunders Company, 1918. Price, $6.00.

This second edition of Dr. Allen's book bears the stamp of progress. There is scarcely any operative procedure that cannot be done under local anesthesia, and either the technique is to be found in this book or the principles taught, so that anyone competent to do the surgical work can, either personally or by direction, have the anesthesia carried out.

The employment of local anesthesia in the removal of the prostate seems to have come to stay, and Dr. Allen has worked out a technique which appeals to the surgeon as dependable, and the author is proud of his achievement. The remarkable success of Cushing in the treatment of war wounds of the head is attributable in a great degree to the use of local anesthesia, which he employs exclusively, and the technique of its use in all types of operation about the head and face is fully described and illustrated by Dr. Allen. Improvements and additions have been made, so that the book can be considered to contain practically all that is known upon the subject of local anesthesia. The author is an expert, experienced

surgeon, brought up in a school of surgery second to none in this country, and the book was written under the inspiration of the teachings of Rudolph Matas.

JNO. E. SUMMERS.

THE TREATMENT OF WAR WOUNDS, by W. W. Keen, M.D., LL.D., Emeritus Professor of Surgery, Jefferson Medical College, Philadelphia. Second edition, reset. 12mo, 276 pages, illustrated. Philadelphia and London: W. B. Saunders Company, 1918. Cloth, $2.00 net.

Dr. Keen has been gracious enough to compile for the information of American surgeons what, in his judgment, has to date proven most valuable and worth while in the treatment of war wounds.

One would have to read many of the "War Books" in order to gain the information contained in this little book of 277 pages. Most of all, we have in it the rare judgment of Dr. Keen in measuring the value of methods and remedies.

It is to be hoped that he may find time in the near future to add to his "Keen's Surgery" the remarkable advances which the opportunities of the war have afforded in increasing our knowledge of the practice of surgery.

JNO. E. SUMMERS.

COLLECTED PAPERS OF THE MAYO CLINIC, Vol. IX, 1917, Rochester, Minn. Philadelphia and London: W. B. Saunders Company.

The annual publications of the Collected Papers of the Mayo Clinics are too well known to the profession to require more than a notation of the issuance of the book of the year.

The 1917 volume has 148 fewer pages than that of the year 1916. There are thirty-four principal contributors who have written many papers under the broad general headings of The Alimentary Canal; Urogenital Organs; Ductless Glands; Heart; Blood; Skin and Venereal; Head, Trunk and Extremities; Technique; General.

A noticeable change in the general character of the papers is in evidence. There are fewer permutations and combinations of the subjects which have chiefly given this remarkable Clinic fame, and there is a better stabilization of the *science* of medicine and surgery—more notable than was remarked in our review of the 1916 volume.

The amalgamation of the Mayo Clinic with the University of Minnesota is developing an educational institution, in many respects *the* leading one in the country. However much our older medical centers may boast of great men as teachers and graduates, yet in these times of progress in every art and science, we cannot rest upon tradition: not only must foundations be reinforced but superstructures modernized.

The Mayo Foundation has enabled graduate work in medicine in the University of Minnesota to be established. "The object of the University of Minnesota is to place graduate work in medicine on a University basis." Candidates for the degree of Ph.D. must present a bachelor's degree or its equivalent, or when the degree of doctor of medicine alone is presented it must be from an institution that is in Class A of the American Medical Association, and in addition "an interneship in an approved hospi-

tal, or assistantship in the laboratory of an acceptable medical school. In the fundamental laboratory sciences—anatomy, physiology, bacteriology, pathology, and pharmacology—properly prepared students may be admitted without the possession of the degree of doctor of medicine, and of course without the interneship as candidates for the Master's degree—M.A. or M.S.—or the unmodified Doctor's degree—Ph.D."

The courses are from one to three years, according to subjects selected. In 1917 there were 118 graduate students, and degrees were conferred upon twelve candidates. It is interesting to note that only two of the candidates received their degrees in surgery—one a Master of Philosophy and the other a Master of Science. The remaining degrees—Master of Arts, Master of Science, etc.—were conferred, *three* in anatomy, *one* in neurology, *one* in bacteriology, *one* in pathology, *two* in medicine, and *one* in pediatrics.

Twenty-six medical schools were represented in the graduate student body at the University Medical School of Minnesota. It is not too much to predict that in the near future, because of the establishment of the Mayo Foundation, Rochester will become the Mecca for advanced medical education as it is today for observation of all that is best in American surgery.

Stipends annually paid Fellows in the Graduate Medical School aggregate about $50,000, $40,000 of which is for fellowships at Rochester.

JNO. E. SUMMERS.

THE A B C OF AVIATION, by Capt. Victor W. Pagé, Sig. R. C. A. S. New York City: The Norman W. Henley Publishing Company. Illustrated. Price, $2.50.

This is another work by Captain Pagé, who recently published a dictionary of the current terms in use in the field of aeronautics, both in English and French.

The present work comprises 274 pages of text and is excellently illustrated with line and lithographic cuts and a number of inserts. It takes up the question of aeronautics at "A" and carries it through to the ultimate letter of the alphabet and is clear and precise in all its chapters.

Chapters IV, IX and XII are worthy of special consideration, but the entire work is instructive and should be of value to anyone interested in flying, whether he be accomplished in the art, or a beginner. It is a good book for anyone who intends to travel by air to possess.

JAMES ROBB CHURCH.

SURGICAL TREATMENT—A Practical Treatise on the Therapy of Surgical Diseases for the Use of Practitioners and Students of Surgery, by James Peter Warbasse, M.D., Fellow of the American College of Surgeons, American Medical Association, American Academy of Medicine; formerly Attending Surgeon to the Methodist Episcopal Hospital, Brooklyn, New York. In three volumes, with 2,400 illustrations. Volume I. Philadelphia and London: W. B. Saunders Company, 1918. Price, $4.50 per volume.

Doctor Warbasse has presented to the profession a very carefully prepared and eminently practical treatise on surgical therapy and technique. The general principles of surgical treatment, asepsis and antisepsis, the

preparation and sterilization of surgical materials, anesthesia and anesthetics, wounds and operations, inflammations, etc., are carefully considered. The surgical treatment of the various tissues and organs is then taken up with painstaking attention to details. The most recent procedures and operations are described, but nothing is given for the sake of novelty. The illustrations are excellent, numerous, and most of them evidently specially prepared for this work.

FRANCIS M. MUNSON.

WAR SURGERY—From Firing Line to Base, by Basil Hughes, D.S.O., M.A., M.B., B.C. (Cantab.), B.Sc. (Lond.), F.R.C.S., Temporary Major, R. A. M. C., T. F., and H. Stanley Banks, M.A., M.B., Ch.B. (Glasgow), D.P.H. (Cantab.), Captain, R. A. M. C., T.F. With special chapters by Lieut. Col. L. F. Smith, C. M. G., R. A. M. C., and Miss C. Bilton, R. R. C., Q. A. I. M. N. S. Introduction by Colonel Sir T. Crisp English, K. C. M. G., F. R. C. S., A. M. S.; Consulting Surgeon to the British Forces in Italy and formerly to the British Salonika Force; Surgeon, St. George's Hospital, London. New York: William Wood and Company, 1919. Price, $9.

The authors have described in this volume of about 600 pages the treatment of wounded men from the time of the infliction of their wounds on the firing line to the time when they leave the base hospital either for duty or for further treatment at the different institutions set apart for special types of injury. The newer and up-to-date methods of wound treatment are dwelt upon; the older methods are not discussed. Procedures are emphasized that reduce to a minimum the stiffness and incapacity that follow severe wounds. These methods place the wounded man under the best possible conditions to benefit from subsequent orthopedic treatment. Several chapters are devoted to burns, amputations and diseases peculiar to airmen.

The book is well illustrated from drawings and photographs. A unique feature is the use of colored plates showing in a humorous way the contentment of the British soldier while under surgical treatment.

FRANCIS M. MUNSON.

DIAGNOSTICS AND TREATMENT OF TROPICAL DISEASES, by Edward R. Stitt, A.B., Ph.G., M.D., LL.D., Rear Admiral, Medical Corps, United States Navy; Commanding Officer and Head of Department of Tropical Medicine, U. S. Naval Medical School, etc. Third edition, revised; with 119 illustrations. Philadelphia: P. Blakiston's Son & Co. Price, $2.

The material changes in the third edition of this valuable book are not great. The subject of trench fever has been rewritten and now embodies our recently acquired knowledge of the epidemiology of that disease. Some of the sections have been rearranged and a plate of the malarial parasites and two illustrations are new.

FRANCIS M. MUNSON.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

DR. LYMAN SPALDING, THE ORIGINATOR OF THE UNITED STATES PHARMACOPOEIA, by Dr. James Alfred Spalding. Boston: W. M. Leonard, Publisher. Printed for private circulation.

QUARTERLY MEDICAL CLINICS, by Frank Smithies, M.D., Vol. 1, No. 1. St. Louis: Medicine and Surgery Publishing Company, Inc.

THE DIAGNOSTICS AND TREATMENT OF TROPICAL DISEASES, by E. R. Stitt, A.B., Ph.G., M.D., LL.D., Rear Admiral, M. C., U. S. Navy. Third Edition. Philadelphia. P. Blakiston's Son & Co. Price, $2.00.

BEVERAGES AND THEIR ADULTERATION, by Harvey W. Wiley, M.D., Philadelphia: P. Blakiston's Son & Co. Price, $3.50.

INSTRUMENTS AND APPLIANCES

APPARATUS FOR THE TREATMENT OF SIMPLE AND COMPOUND FRACTURES OF LONG BONES

By 1st Lieutenant GEORGE Y. MASSENBURG
Medical Corps, United States Army

(With three illustrations)

A simple sliding iron bridge which was being used by the English Doctors Fitzwilliams, in a hospital in Roumania, for approximation of the ends of a compound fracture with loss of bone, suggested the idea of utilizing such a device adjustable in three right-angled planes instead of one, sufficiently strong to have an opening large enough for the treatment of a fairly large wound of a compound fracture. Efforts to improve the splint led to the adoption of a ball and socket device allowing the adjustment of the long axis of the fractured fragments, which may prove useful in the treatment of compound and simple fractures.

Application.—Two splints are used on the thigh and one on the leg. The locations for the splints are selected, plaster stocking, flannel bandages and plaster applied in the usual way, under ether or spinal anesthesia, leaving a circumferential opening over the seat of fracture and wound, over which the splints will bridge and permit adjustments. Additional layers of plaster must be applied under and above each metal plate that fixes the apparatus to the cast, with a figure-of-eight plaster bandage over and beneath the limb to the base of the splint to secure it firmly.

Adjustments of the fragments are made under the fluoroscopic screen or at the operating table. The wide opening in the plaster allows room for operating and for removing necrosed bone, shell fragments and other foreign bodies. The bridges are removable.

The device was used in four cases, a short résumé of which follows:

Case 1.—Shell wound. Compound fracture of upper third of left femur of three months' standing. Operated twice previously. X-ray showed loss of about 3 inches of bone with some necrosis of both ends, also extreme decalcification of bones. The case was considered one for amputation, but in an effort to save the leg, this apparatus was employed. The plaster and device were applied, using only the one piece in Fig. 1A. After the plaster had well hardened, an operation for the removal of the necrosed bone was easily accomplished and the ends brought into perfect apposition and there maintained, though the immobilization was not perfect. The one splint of this type and strength seemed a bit insufficient for such a heavy cast. After

a week the plaster became wet and soiled by the excessive purulent discharge and the use of Dakin's solution. His condition grew worse and an amputation had to be done. Dakin's solution was applied to the unsutured stump, and the patient made an uneventful recovery.

Case 2.—Shrapnel wound. Compound fracture of thigh, lower third. X-ray showed loss of about 2 inches of bone, a loose piece of necrosed bone and several small pieces of shrapnel; bones badly decalcified. Operation: removal of necrosed bone and shrapnel under fluoroscope. Wound treated two weeks with Dakin's solution before apparatus was applied and correction of the displacement was made on two occasions under the fluoroscopic screen, the first as soon as the plaster hardened, the second five days later. The wound was left wide open, no reaction followed manipulation. The separation was reduced to only one-quarter inch.

The pull of the gastrocnemius displaced the lower fragment about one inch backwards. A bit of the plaster was cut away anterior to the lower fragment and a pad was placed on a wooden splint across the opening in the plaster at the back to aid in the correction. The deformity was corrected one-half inch. In three weeks the bone had granulated over and in five weeks by X-ray definite process of osteogenesis was observed between the two fragments.

Case 3.—Extremely thin and emaciated patient with severe shell wound of lower right leg. Entered hospital two months after receiving wound. Was operated on twice previously. X-ray showed loss of one inch of tibia, fractured fibula with necrosis of ends of bones, small piece of shell between fragments, extreme decalcification of bones. Ugly suppurating wound and large bed sore on heel. Intense pain on moving, in dressing the wound. Operation: removal of fragment of shell and the necrosed ends of both bones. The apparatus was immediately applied. One curved plaster plate was reversed to conform to the sole of the foot; plaster was applied just including enough of the heel to keep foot from slipping out. The other piece was fixed to the outer side of the leg. The correct apposition of bones was made through the wound and the fixation bolts made tight. Wound left wide open. There was perfect fixation and immobilization. Patient up on crutches in ten days. No pain after first few days following operation.

In two weeks ends of bones were granulated over and in one month after formation of new bone observed by X-ray. Bed sore healed in eight weeks.

Case 4.—Old shell wound fracture of middle third of femur, healed wound, bad apposition and beginning callus. Apparatus was put on with the hope of correcting the deformity. In three days the fortunes of war made retirement from the country necessary, ending further observation of these cases.

Unfortunately final results in the treatment of fractures with this apparatus cannot be given, but its use indicates that it has some advantages; the possibility of correction of any displacement of the fractured ends; the possibility of operating through the wide opening in the cast with the removal of the bridge; the apposition with immobilization and fixation of the fragments through open wound; correction and fixation of malposition beneath the fluoro-

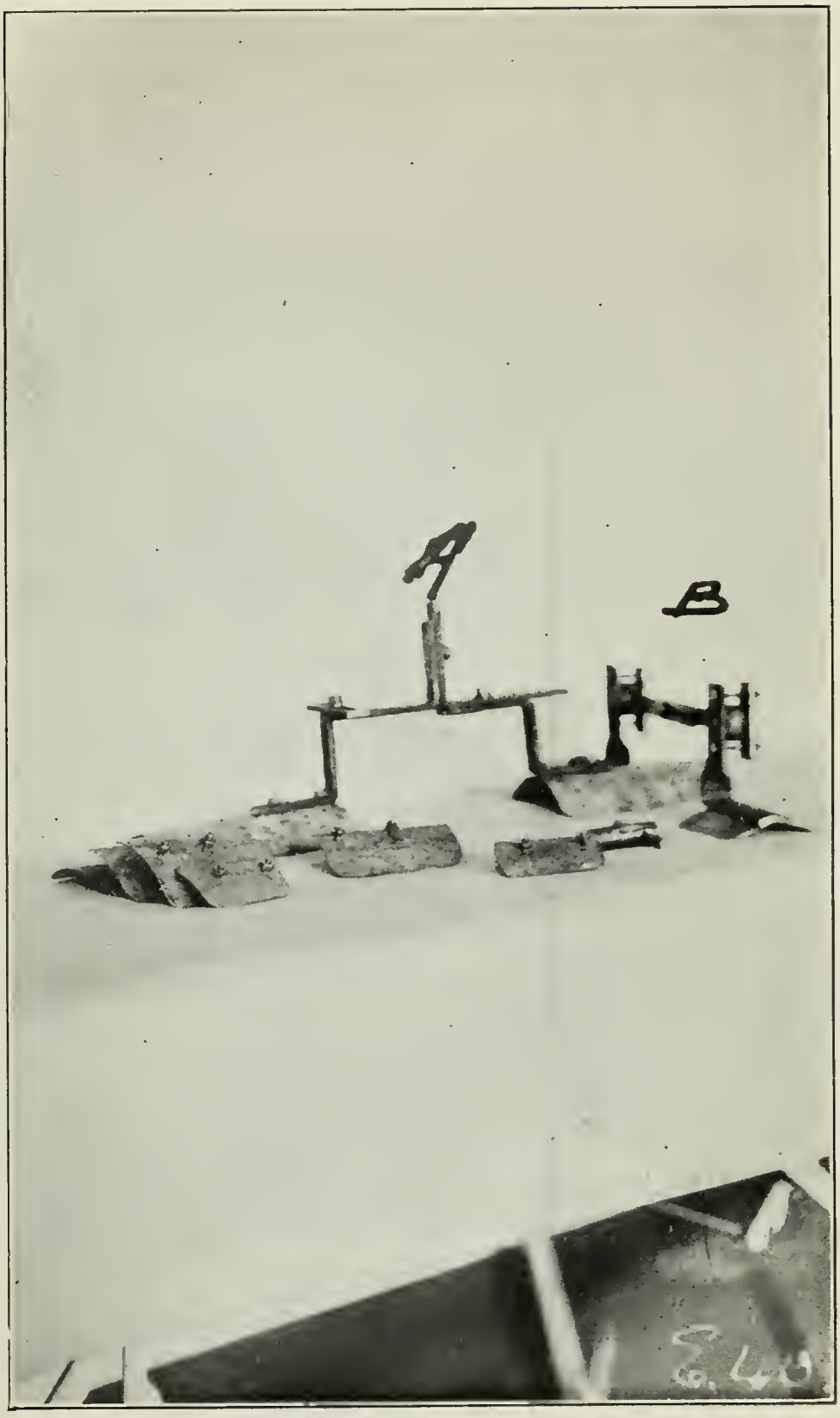


FIG. 1.

(To face page 428)

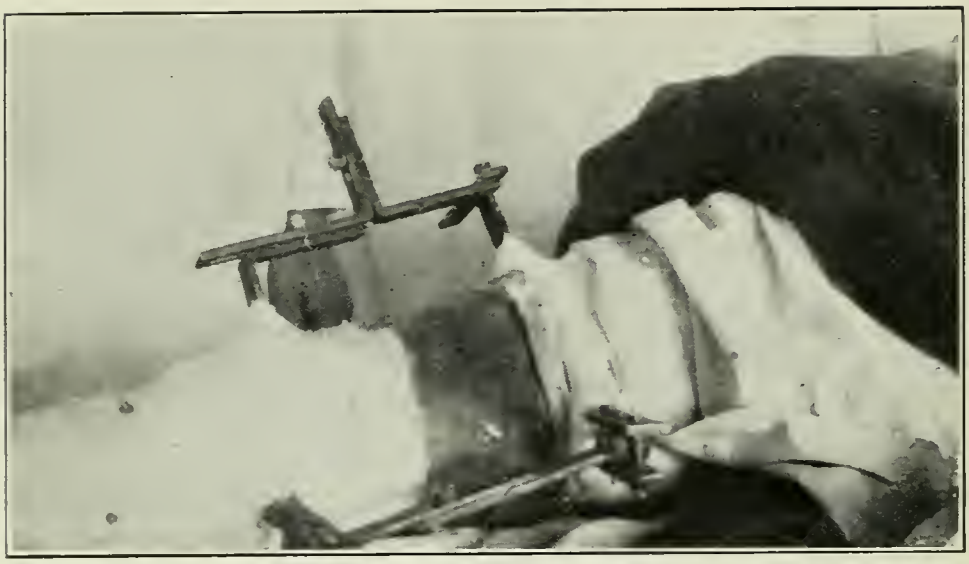


Fig. 2.

Fig. 3.

scopic screen, without operation. The wide opening left for the dressing of wound makes dressings much easier and without pain on motion. It seems that it would also be an excellent splint in the treatment of simple fractures, though there were none on which to try it.

The disadvantages are that the cast may become badly soiled and the use of Dakin's solution difficult. These difficulties may be overcome by protecting the cast with a rubber collar such as a barber uses in haircutting, or by spraying ambrine around the edges. The weight of the cast and the danger to joints in keeping them too long immobilized are additional disadvantages. There are probably many others, but the device has been used too short a time to know its worth. The success met with in such a short time certainly justifies its use in a selected class of cases.

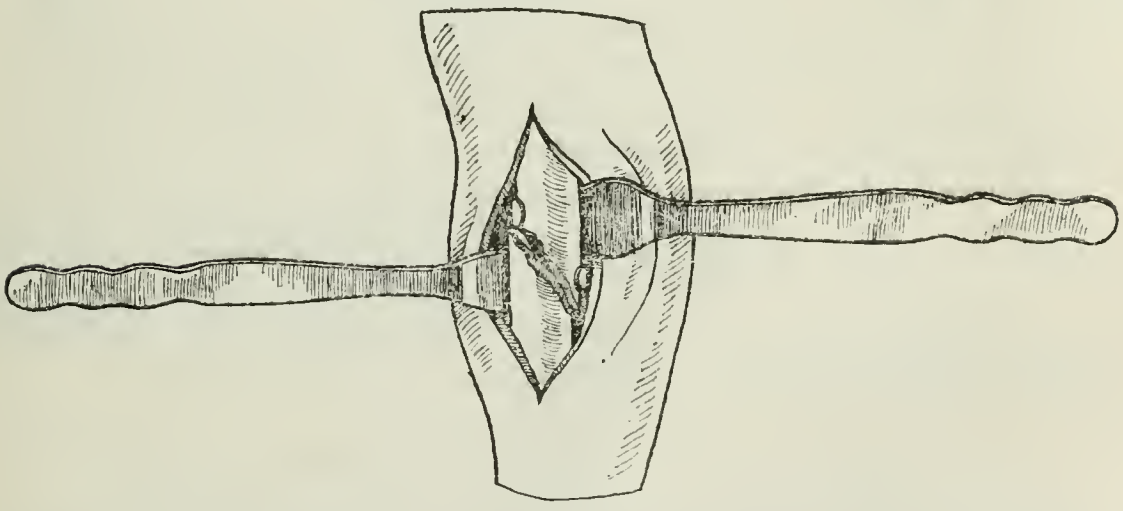
BONE GRAFT RETRACTORS

By Major GUY C. BOUGHTON

Medical Corps, United States Army

(With two illustrations)

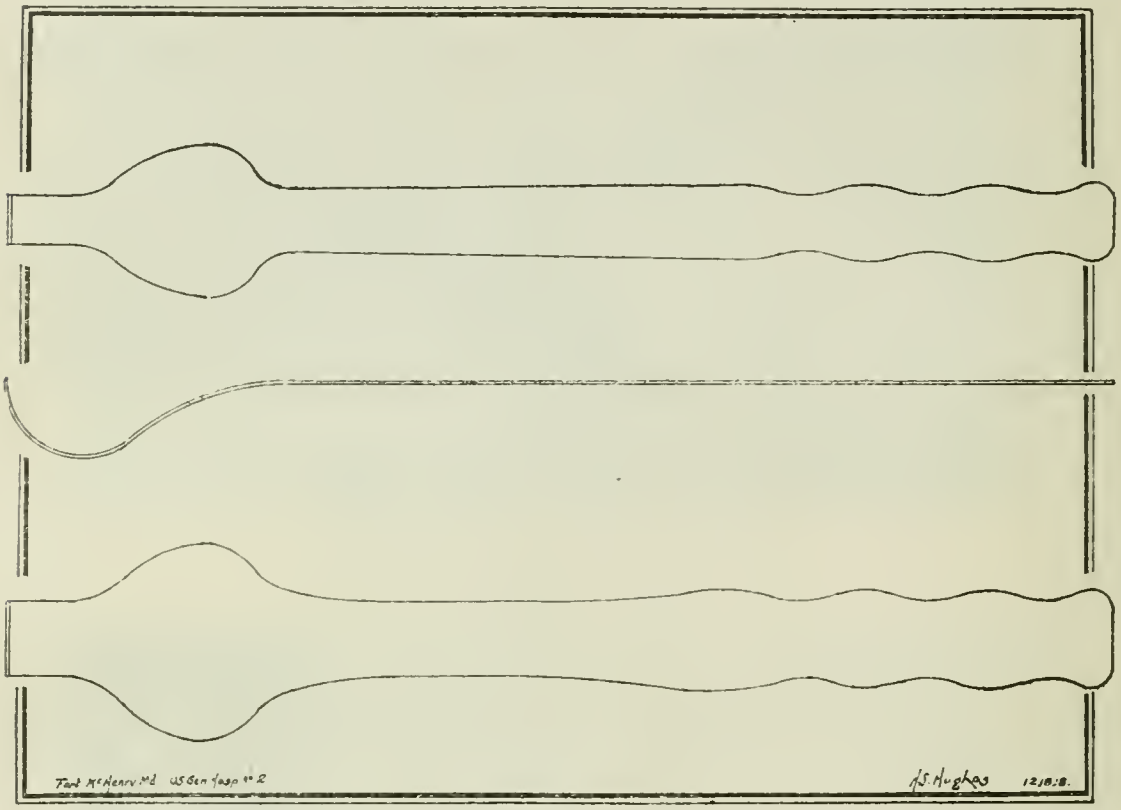
Certain limitations of the retractors now used in bone surgery are responsible for submitting this description of the type of in-



struments used by the writer at United States Army General Hospital No. 2, Fort McHenry, Md.

These retractors are made of No. 20 gauge instrument steel and present a long, spoon-like appearance with a handle about 10 inches long and about ¾-inch in width. The metal flares out, forming a broad, flat belly, which is bent downward at an angle of about 30 degrees and terminates in a shallow hook.

It has been found when using these retractors that none of the usual difficulties are encountered. The broad belly at one end so covers the soft parts and protects them from injury that a clean field of operation is presented.



The instruments are made in three sizes and one or more are used as required. Their length makes them in a large measure self-retaining and leaves the assistant's hands free for other work.

Summary of advantages of these retractors:

(a) There is a clear field of operation for bone work.
(b) There is less trauma to soft parts.
(c) The instruments are largely self-retaining.
(d) The three sizes permit their use on bone of any size.

THE WASHING OF DISHES IN COMPANY MESSES IN CAMPS

By Lieut. Col. ISAAC W. BREWER and Capt. DANIEL A. EISELINE
Medical Corps, United States Army

(With three illustrations)

The methods of washing dishes in military kitchens in camps and cantonments are far from satisfactory. This has long been recognized by the sanitary officers of the Army and many efforts

at improving conditions have been made. After the recent epidemic of influenza the importance of this matter was so apparent that the question was referred to several medical officers, with a request that there be devised some apparatus that could be constructed by company labor at a minimum cost and at the same time be reasonably efficient in sterilizing the dishes. Capt. D. A. Eiseline, sanitary inspector, who has had long experience in municipal health admin-

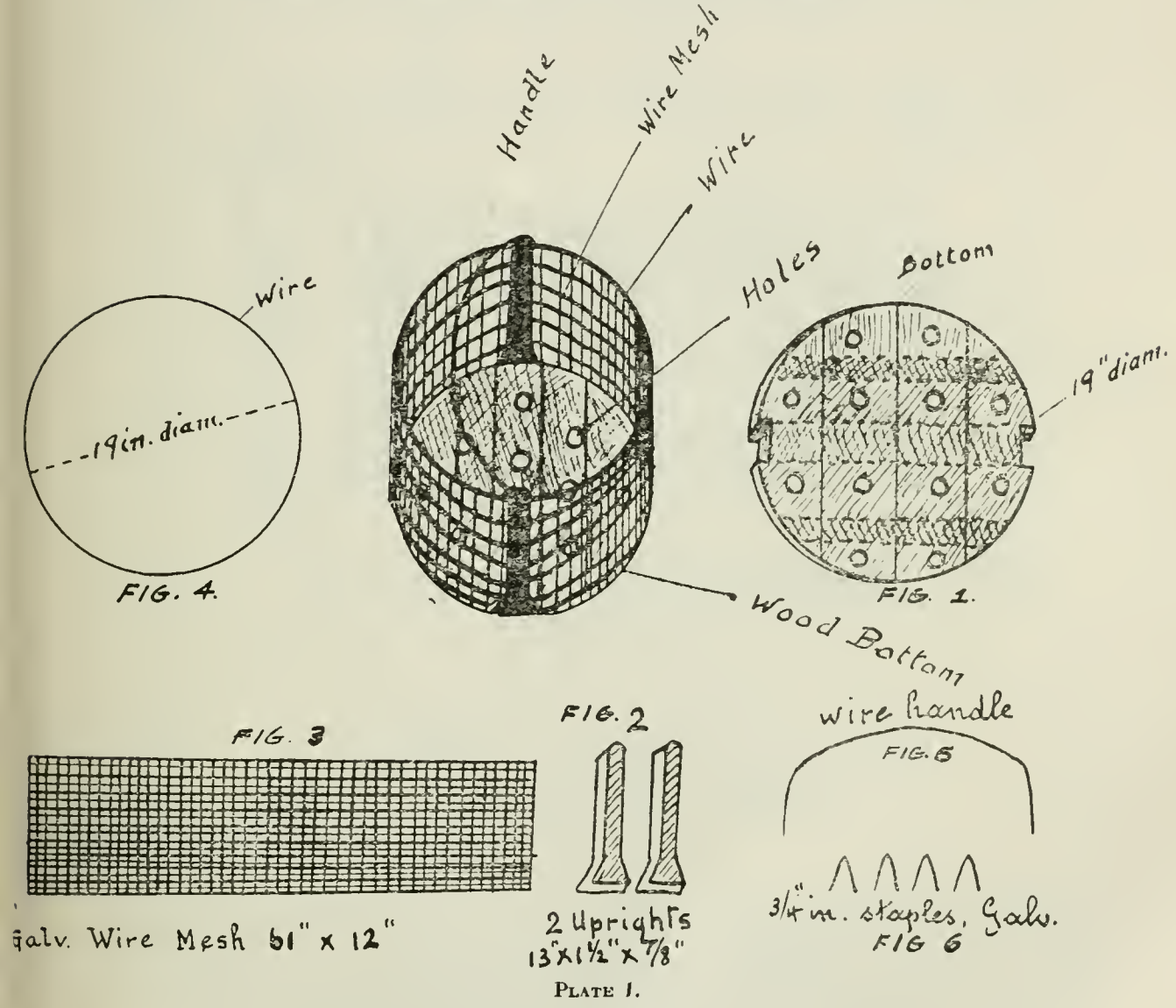


PLATE I.

istration, devised an apparatus that seemed to fulfil the requirements. It was tested in a number of companies and found to work satisfactorily, and was then studied from a sanitary point of view at the laboratory of the base hospital. Dishes washed by the usual method and wiped by cloths contained 120 colonies per cubic centimeter, but when washed by the method hereinafter described only 6 colonies per cubic centimeter were found.

The following description is by Captain Eiseline, who devised the apparatus:

The facilities for washing the dishes and mess kits used by the men at this camp are such that, from a sanitary point of view, much is to be desired.

The kitchen police are generally men who have been detailed to do this work on account of some infraction of discipline or inability to perform

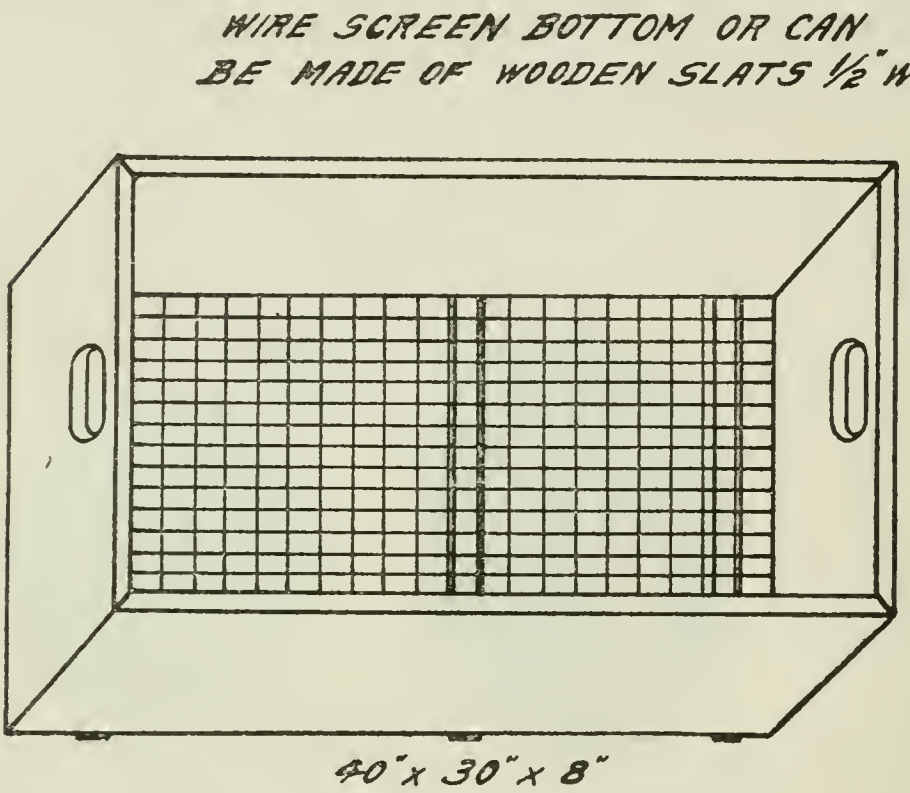


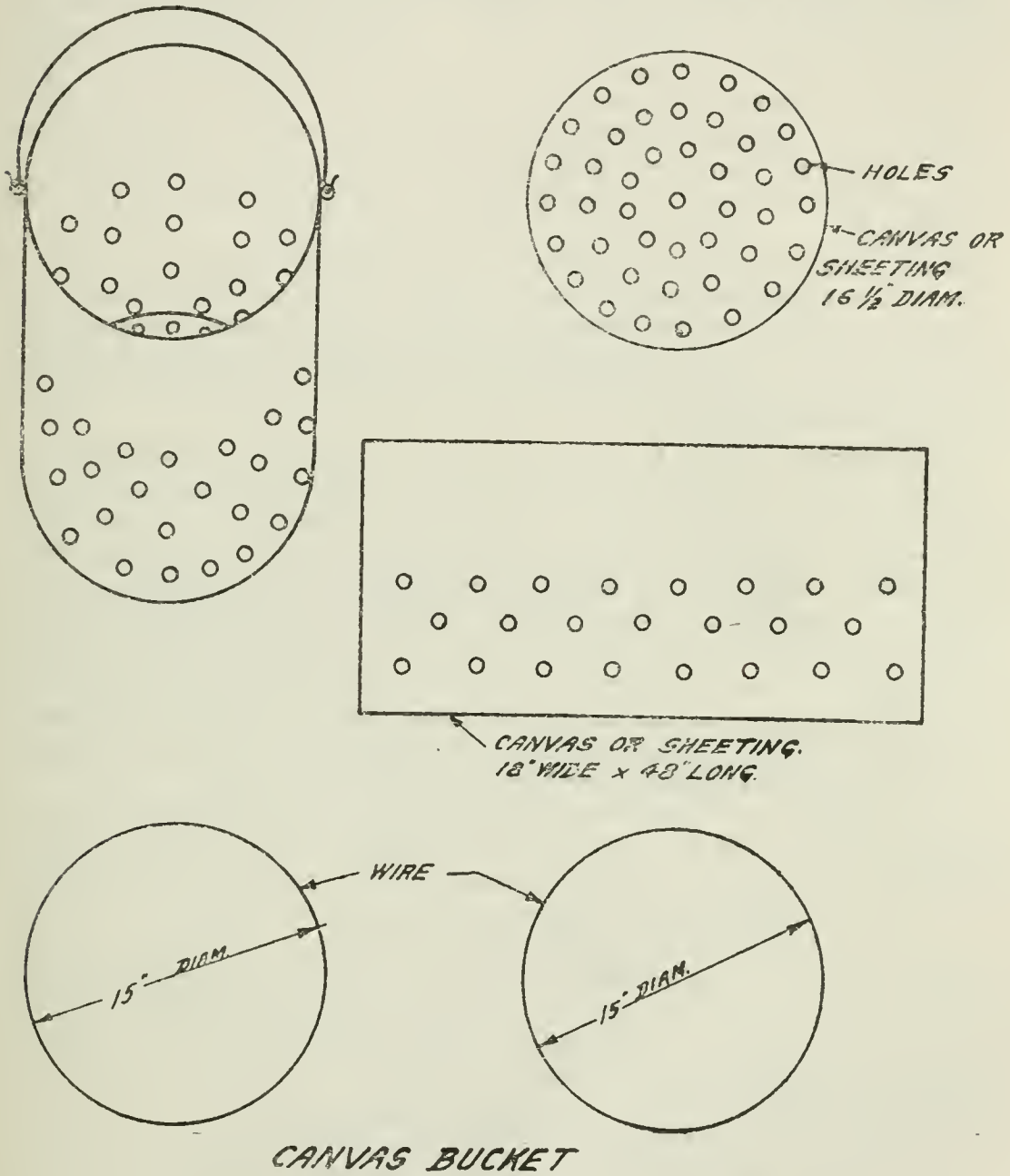
PLATE II.

other military duties, and they do not know, and care much less, how it should be done. The usual method is to wash the dishes in soapy water, then wipe them. Sometimes, after washing in soapy water, the dishes are rinsed in hot water and then wiped or allowed to dry by evaporation. It has been frequently observed that the water is not changed and the grease and particles of food on the dishes accumulate in it. The water soon loses its heat and as a result there forms on the dishes a greasy film which is wiped off by the towel. The towel soon becomes moist and greasy, but it is not discarded, and consequently the dishes feel greasy and are not clean even after being wiped.

The mess kits are not wiped at all, but are allowed to dry by evaporation; each man washes his own kit.

At this camp a method was tried, which not only removes the defects

mentioned, but expedites the work and requires fewer men in the performance. There is nothing new in the method aside from the fact that it is not usually employed; the utensils can be constructed by each company or organization from materials usually found on hand or readily obtained.



CANVAS BUCKET FOR BOILING MESS KITS.

Plate III.

The apparatus consists of a 24-inch wash tub for boiling the water, a wire screen basket in which the dishes are to be placed, and a box or tray in which to place them while drying.

The basket (Fig. 1) is 19 inches in diameter, with a round bottom (A), made of ⅞-inch pine boards held together by three cross pieces of the same material. Two notches are cut at the ends of the middle cross piece for the

base of the uprights. About 30 holes, each ⅞ inch in diameter, are bored through the bottom. Other requisites are two uprights or supports (B) of ⅞-inch pine, 13 inches long and 2 inches wide; galvanized wire screen with ¼ inch or ½ inch mesh (C), 61 inches long and 12 inches wide; a wire ring (D), made of No. 8 wire 63¾ inches long and marked 2 inches from each end, lapped at these marks and the ends twisted to hold it together (this should make a ring 19 inches in diameter and is placed as a support at the upper rim of the basket, the screen wire being bent over the ring); a handle (E), made of the same kind of wire and sufficiently long to afford plenty of space through which to pass the dishes; ¾-inch galvanized iron staples (F) to fasten the wire handle and the screen wire at the sides and bottom.

The drying tray (Fig. 2) is an oblong box, the sides of which are made of ⅞-inch pine boards and the bottom of the wire screen material. Three 1-inch strips of wood are placed across the bottom, one of these being fastened near each end of the box and one across the center. These strips support the screen wire bottom and also elevate it, thus facilitating the drainage and drying of the dishes.

Each kitchen should have at least three baskets and two boxes. The washing is done as follows: After the food residue has been scraped from the dishes, one man places them in the sink containing warm, soapy water, scrubs each dish with a brush or mop and places it in the basket. When the basket is almost filled it is placed by another man in the galvanized iron wash tub containing boiling water, the tub being on the cook-stove. After boiling for three minutes, the basket is removed from the tub and the heated dishes placed in the box or tray to dry. The drying takes place rapidly and the dishes are taken in the tray to the mess table or stored. In the meantime, a second basket has been filled, the dishes boiled and removed as before, and this is continued rapidly until all are cleaned.

At a kitchen that messed 232 men it took ten men 1¾ hours to clean the dishes when done the ordinary way, and then the dishes were not clean. With the basket and trays, three men did this work for a mess of 114 men in 45 minutes, and the dishes were really clean.

A basket for boiling mess kits can be similarly constructed, but the diameter should be less in order to fit into one of the standard galvanized iron cans used in the field. A bucket made of canvas or unbleached sheeting can be used and has the advantage of being more portable. As it is collapsible it requires very little space for storing.

The bottom of the basket can be made of wire screen also, but this has the disadvantage of not being as strong as a wooden bottom.

Boiling mess kits will probably take a trifle longer than the usual way. As the common method is decidedly unsanitary, in that the majority of the men do not take the time to thoroughly clean and dry their kits, the little extra time expended will be more than compensated for by the added cleanliness of the utensils, the drying of the kits after immersion in the hot water will prevent the adhering of dust and dirt. Some of the men keep their kits polished and neat, but others do not. This method would tend to show up the unclean kits, and the men using them would have an object lesson in cleanliness that would be of advantage to them.

Three or four baskets or buckets should be used, six or eight men placing

their kits in a basket, and as this is being boiled a second squad may be getting ready. After boiling for three minutes or more, each man removes his kit from the basket.

Fig. 3 shows an apparatus devised for field use. This consists of a canvas bag which can be dipped into a bucket of boiling water and allowed to remain for a few minutes.

SUGGESTION FOR A DISH-WASHING TABLE

By Major W. F. VON ZELINSKI

Medical Reserve Corps, United States Army

(With one illustration)

The appended drawing gives the details of a table which has been in use outside the mess halls of the 8th Field Artillery at Camp Wheeler since March, 1918.

The following points were considered in the construction of this table:

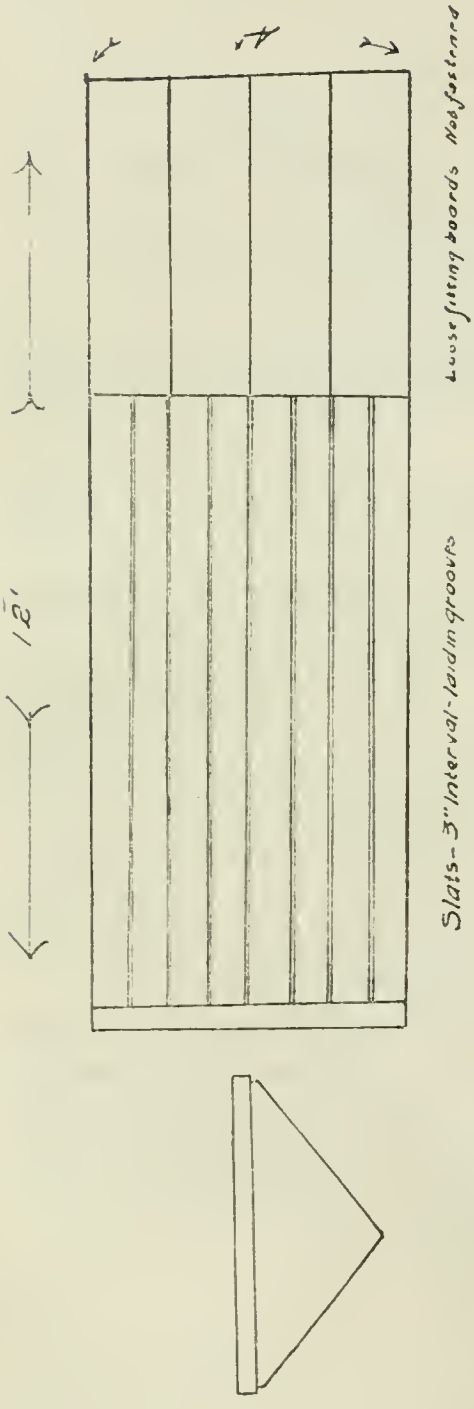
1. To avoid splashing and dripping of wash-water about the ground, which latter is a source of attraction to flies.

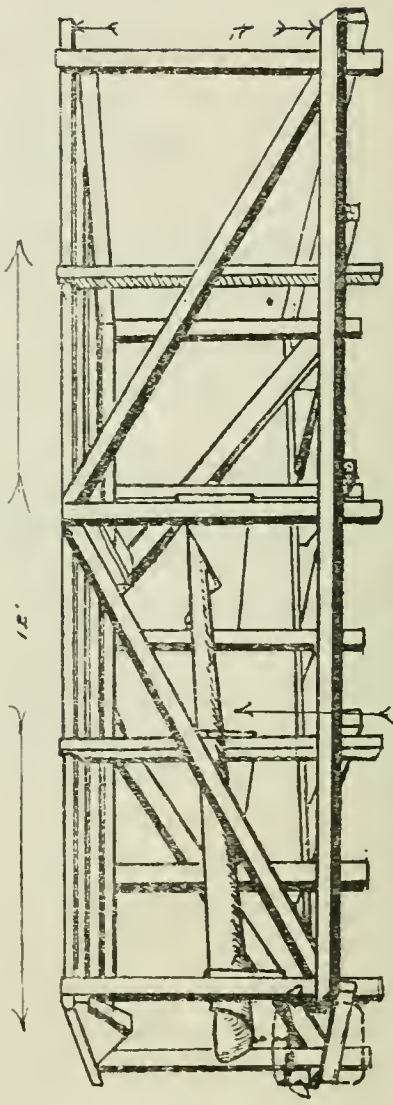
2. To save time, effort and ready soiling of fatigue clothes in performing the duties of this detail.

3. To obtain the benefits of sunlight and free aeration after dishes and cooking utensils have been washed and dried.

4. To avoid the accumulation of grease and other organic material, as is the case around and upon tables or benches ordinarily used for this purpose; in the table here described, all parts are readily accessible and, to a great extent, removable.

The table as now used is not changed in any respect from the original plans, although suggestions and criticisms have been invited. Battery commanders and mess officers have generally expressed a favorable opinion of this manner of handling this detail as compared with other methods. It may be remarked that the size of the table may vary with the size of the mess.





SUGGESTIONS FOR DISHWASHING.

THE
MILITARY SURGEON

VOL. XLIV MAY, 1919 Number 5

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

AVIATION AND WOUNDED IN THE DESERT OF SAHARA[1]

BY PROF. THEODORE TUFFIER

Consulting Surgeon, French Army

(With one illustration)

[*Note by the Editor.*—The following article by Professor Tuffier seems very timely, following, as it does, the contribution which appeared in our April number by Major S. M. strong, M. C., U. S. A., entitled "Aero Ambulance." Anything written over Professor Tuffier's signature must of necessity be authoritative, and his experience in this method of transport of the wounded in the remote and disturbed regions of the Sahara is certainly very convincing.—J. R. C.]

ON THE 21st of January, 1918, I was sent to Tafilalet where there was a general officer seriously wounded. During my stay in southern Morocco, I had an opportunity to appreciate the services which aviation renders and can render to our wounded in the posts in the Sahara. I take this opportunity to remind you that it was one of the members of our House of Parliament, Dr. Chassaing, who during the present war proposed to have made in France the first airships designed especially for the transport of wounded. More recently others have suggested the application of aviation service to the transport of all the matériel of an ambulance.

. . . . . .

That which follows is my personal experience, compiled from my notes.

General X—— was wounded on the 15th of January at Tafilalet in the Desert of Sahara. He received a penetrating wound of the chest, caused by a fragment of high explosive shell, at the level of

[1] Translated by James Robb Church.

the fourth intercostal space, 3 c.c. from the left edge of the sternum. Prior to being wounded, this officer had symptoms of a slight bronchitis. He was taken to the rear on a hand litter as far as Ksar-es-Souk, a distance of 25 kilometers, and there placed in a dressing station. On the following day his condition was serious, respiration difficult, temperature up to 38.5, dyspnea very marked. A localized pleural effusion at the posterior part of the chest increased as far as the root of the lung. The medical officer who was taking care of the case asked by telephone for surgical help from the Residence of Rabat, a distance of 560 kilometers. Major Faure of the Medical Corps was sent by a Farman plane from Fez a Mekenes (60 kilometers) in three-quarters of an hour, then from there by a Newport plane in a direct line to Ksar-es-Souk (250 kilometers) arriving two hours and thirty-five minutes after his departure. This flight necessitated the passage of both the greater and lesser Atlas Mountains at an altitude of 4,000 meters and over a country occupied by the enemy. The trip was made without difficulty, except that the pilot lost his way for a short time in the desert.

At the same time the Surgeon Major of the District left in an ordinary airship from Bou-denib, made 90 kilometers in one hour and, landing at Ksar-es-Souk, joined his colleague.

By any other route the wounded man would have been 945 kilometers from Oran and 275 kilometers from any military railroad (Oran to Colomb-Bechar, 690 kilometers; Colomb-Bechar to Ain-chair, 75 kilometers; Ain-chair to Bou-denib, 110 kilometers; and from there to Ksar-es-Souk, 85 kilometers), which would mean a journey of nine days. The following day his condition was worse. The aid station at Ksar-es-Souk furnished, at best, shelter for the wounded man; the surgeons were without any means for the localization of foreign bodies and lacked sufficient installation for surgical intervention. After having weighed carefully all the disadvantages of further movement, it was decided to evacuate the wounded man to Bou-denib. The air route was the only practicable one. A new Farman plane was sent, the wounded man was placed in a half-lying position in the cockpit occupied by the observer, and, escorted by two other planes, with his two surgeons he was landed an hour afterward at Bou-denib (85 kilometers).

All this was not accomplished without *contretemps*. In the first place the surgeon came from Mekenes, and as his pilot had lost his

maps, went some kilometers farther than he should, owing to his error in direction. The placing in position of the litter at Ksar-es-Souk was a difficult matter; an inclined plane was made by placing a number of sacks of barley to support the upper part of the apparatus. Further, the position of the wounded man, half-lying, on a mattress in the cockpit of the observer, left him with his head above the windshield, and during the flight the violence of the wind made respiration difficult and, furthermore, resulted in a general chilling of the body.

In spite of this extemporized apparatus, the condition of the wounded man, after he had been warmed up in a hospital with ample resources, was very good and on the following day his temperature, which had been 39.4 when he left, did not rise above 39; the pleural effusion was not increased and the symptoms of bronchitis were not accentuated. Radioscopy showed a fragment of shell about as large as a bean situated 16 c.c. in depth to the rear of the sternocostal plane, and that it moved with the beating of the heart and appeared to be outside of the posterior cardiac wall itself.

The nature of the country occupied by the enemy and the atmospheric conditions obliged me to make the journey by road, and I reached the wounded man on the 25th of January. His condition was extremely grave; he was cyanotic, suffering somewhat from dyspnea, and his temperature had been steadily mounting for the past two days from 39 to 39.7. There was congestion of the entire wounded lung, some coarse râles on the opposite side, and pleural effusion, not very abundant, which, having already been aspirated once, had shown the presence of blood and serum. This was present as far up as the point of the scapula and was localized at the level of the fragment of the shell. The seriousness of this condition, the double pulmonary congestion and the fact that the wounded man was very stout made it necessary to determine upon an immediate aspiration of this pleuritic effusion situated posterior to the hilum of the lung. A puncture resulted in the drawing off of 750 grams of pure blood. On the following day dyspnea was diminished and the pulmonary excursion free. On the next day the signs of bronchitis diminished and the vesicular murmur was only preceptible at the base of the thorax. The temperature dropped to 38, and two days afterwards the wounded man seemed to us to be out of immediate danger. A later operation, if necessity arose, would permit the evacuation of any further effusion, either bloody or purulent.

and the extraction of the foreign body. For the moment the danger was averted.

To sum up—a wounded man to the south of Tafilalet had been furnished, a few hours after being wounded, competent surgical care from medical officers brought by aeroplanes a distance of more than 300 kilometers. His condition growing worse, it had been possible to send him by a fighting plane to a hospital center where there were facilities to locate by X-ray the foreign body, to make further diagnosis, and where the resources of the institution were sufficient to guarantee satisfactory treatment. The surgeons were taken to the wounded man and the latter was transported by the means best adapted for the purpose.

Profiting by the example of the column in South Morocco and by the presence at Bou-Denib of an air-squadron and one special airship (type A. E. R.), I was able to study the conditions and results of the evacuation of a number of wounded from the post of Ksar-es-Souk to Bou-Denib. This was with the A. E. R. airship of Chassaing which had been built with the modifications suggested by past experience. This carried wounded men with serious injuries of the lower and upper extremities. The following is a note in regard to one of these evacuations: An A. E. R. plane left Bou-Denib on the 27th at 7 o'clock in the morning, landing at Erfoud after having flown over the region occupied by the enemy, a distance of 65 kilometers. The return to Bou-Denib was finished at 11 o'clock without the slightest incident of any sort. The loading of the patients was rather difficult on account of the height of the fuselage from the ground and the necessity of putting in the litter from the top of the machine. The wounded men, one with a serious fracture of the thigh and the other with a badly broken arm, were placed in the fuselage of the ship. The journey was made at an altitude of about 2,000 meters. This altitude was necessary in order to be able to clear the enemy territory. It permitted the pilot, in case of engine trouble, to volplane to a safe landing place, either at the point of departure or at the destination.

I myself personally questioned these two wounded men, and neither of them were apprehensive at any time, according to their statements, either as to the distance to be traversed or in regard to the altitude reached. They arrived in most excellent condition, having suffered no inconvenience whatever. One of them was, in truth, very much astonished to find himself landed so far from the

point of his departure. The unloading of litters was also a rather difficult matter since these machines are built so high from the ground that it is necessary in unloading to take out the litter from the upper part of the fuselage.

The evacuation of wounded by this means had been previously carried out in the region of Tafilalet, in September of 1918, during the first encounter at Camp Tizimi. Out of the sixty wounded, fifteen were transported in the ordinary planes over unconquered territory. The flight of 110 kilometers was made in one hour and ten minutes. The landing field was 800 meters from the post and had a minimum length of 200 meters. One case of gangrene and other cases seriously wounded were also transported without incident. All the pilots who have taken part in this campaign state that wounded may be transported a distance of 200 kilometers at least, and that the chances of any accident are not more than 3 per cent.

It is not only South Morocco that aviation has been applied to the transport of the wounded; in the Sahara its organization is in reality much more advanced. A bombing squadron and one reconnaissance (Breguet type B2 XIV) is stationed at Ouargla, that is to say, in an air line 560 kilometers from Algiers by trail and 855 by railroad. These take care of both the evacuation of the wounded and the transport of medical officers. There is here a true aerial route which goes as far as In-Salah, that is to say, 597 kilometers into the desert itself. The pilots follow a route laid down and mapped; they know all the landing points situated as follows:

Ouargla, 145 Kilometers from rail head to Touggourt.
Berkan, 130 kilometers from Ouargla.
Fort Inifel, 170 kilometers from Berkan.
Aie Guettara, 192 kilometers from Fort Inifel.
In-Salah, 105 Kilometers from Aie Guettara.

They found in these landing posts (which were furnished with wireless) the necessary supplies for repair and replenishment of supplies.

The pilots were able to make this journey of 800 kilometers in seven hours with two landings. In general two flights are necessary, and the journey is often accomplished in two days. The advantage gained is considerable, since the best automobile routes do not enable the journey to be made in less than seven days. And the route is very rough and often cut by enemy attacks. The

caravans by camel or mules arrived at In-Salah from Ouargla in twenty-six days.

In the south of Tunis the Saharan posts have sent their wounded from Bir-Kecira or from Triplitz to the hospital center at Tatahouine, a distance of 90 kilometers. All this transport has been carried out without any accident and generally with the ordinary type of Farman airship. In this same region, medicine and supplies, urgently needed in case of unforeseen skirmishes or surprise actions, have been transported to the designated post in the same manner. During the fight at Bir-Kecira in October, 1918, Dr. B—— (summoned by telephone) was taken to the wounded man who needed him in less than an hour.

. . . . . .

I believe that these facts certainly demonstrate the utility and desirability of a medical air service in the remote regions which are difficult of approach. We are no longer in a state of experimentation, but at the beginning of a rational and methodical organization of this class of service. Rapidity of evacuation is not the only advantage of this method. You know that the posts of the Sahara are very often invested by the enemy and it is true that, as far as Morocco goes, out of 37 posts 14 are in a state of absolute siege, that is to say, 37.8 per cent. These are Erfoud, Ksar-es-Souk, Rich, Itzer, Mrirt, Kasbet-el-Makhzen, Gourrama, Beni Tadjet, Khenifra, Beni Mellal, Outat-al-Hadj, Molinidja, Agadir and Tiznit. These could only be furnished with supplies by sending a convoy once or twice per year. All the wounded and, furthermore, the sick would be obliged to remain there some months without any communication with the service of the rear. Upon summons by wireless, the air route alone can furnish a means of getting into these posts, whether it be to furnish medical assistance or to remove a sick or wounded man. A landing place has been selected and laid out, and it is always possible to use it for the short time necessary for landing or for departure, whatever may be the state of siege. In the case of a column on the march in the Sahara, the evacuations by rail or road are for the most part impracticable. Sick and wounded have to follow the column, either in ambulances or in the "cacolets," and this must be carried out for a period of anywhere from eight to twelve days. It is of course apparent that the enemy cuts off communication behind the troops on the march and that it would necessitate a fairly strong force to send back a

convoy of wounded. As a consequence, the transport by airplane is the only one which can be relied upon for systematic evacuation of sick and wounded. Some modifications will be necessary to make entirely practicable this most advantageous method of transport.

Two kinds of airships have been used—the usual bombing plane or those used in reconnaissance work, and the sanitary ships of the type A. E. R., especially adapted for transport of the wounded.

1. The sanitary airships, in order to make the loading of the litters a simpler matter, ought to open in the side—the Breguet machine was lacking somewhat in speed, in control, and was somewhat difficult to land. These questions Chassaing himself told me he has under consideration, but that they are rather difficult of solution. The number of these machines, at present four to a squadron, may be possibly reduced.

Aside from the sanitary airships which it will be necessary to reserve for cases of grave injury to the chest, abdomen, or the lower limbs, a reconnaissance plane or one of the bombing type will serve perfectly well for the evacuation of the slightly or moderately wounded, and this in truth ought to be one of the functions of this type of machine.

2. The airship represents that which in transport over the ground we call the tractor in French terminology. But the route itself ought to be carefully thought out, definitely fixed, and mapped, and well known by the pilots, with the understanding that at about every 200 kilometers there is a landing place and service of repair. This fixed character of the route, this possibility of journey by relay, gives to the wounded absolute security and permits the airship to make the flight at a relatively low altitude.

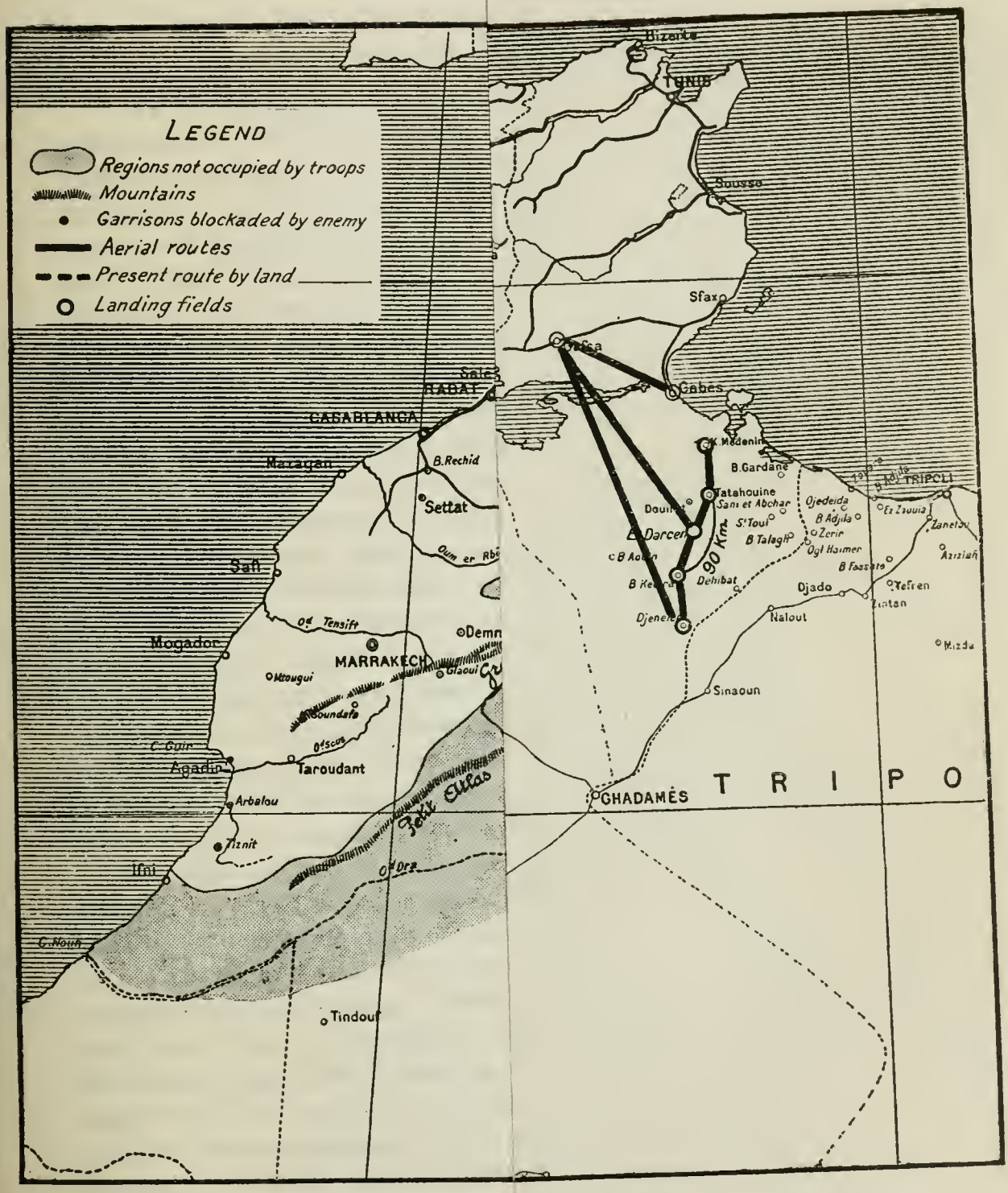
. . . . . .

This very sunny aspect of aviation as applied to the sanitary service in the Sahara is not, however, without some shadows. The pilots encounter two difficulties not of the same importance; the first being that of temperature. This gives rise to strata of air which are naturally of widely different degrees of heat and in consequence many dangerous air pockets exist. It is not uncommon for an airship to run into strata of such density that a rapid fall of 200 meters or more is the consequence. This danger is lessened in a flight of 1,500 to 2,000 meters altitude. Our wounded, of whatever character, have to make the best of this altitude, but it is necessary that in summer the departure should not be after 7 o'clock in the

morning, since the atmospheric disturbances do not usually occur until after this time. However, the serious enemy of the sanitary side of aviation, and that of aviators in general, is, in this locality, the sirocco; this exceedingly violent wind, which blows sometimes two, three or even six days in succession, very often tearing down the hangars and causing the soldiers to seek shelter, can interfere with and often absolutely prevent any flight. The ill effect of this wind exists less in its violence than in the cloud of dust which it stirs up. This dust is exceedingly fine and will penetrate every crevice and, as you probably know, even into the case of a watch. All the machinery of an airplane can thus very readily be damaged or even put out of commission entirely. But perhaps the most serious danger of these dust clouds is their extent, the height to which they rise, and their density, which makes a descent practically out of the question. The pilot who gets into one of these dust storms cannot distinguish the landing field nor can he be sure of his direction. He cannot approach the earth without very grave risk. During the sirocco the air route is then absolutely closed. However, during the summer season the occurrence of these winds is about one day out of five; it is necessary then to count on an absolute check to sanitary aviation during this time. This is a weak point which we shall never be able to mend; it limits the advantages of air traffic but is not a contra-indication to the employment of it nor does it diminish in the least the importance of this method of transport.

The present state of aviation in connection with the sanitary service is only the first step towards a perfected scheme. Its expansion, both as to number and as to power of machine, and perhaps as to method for the systematic transport of medicine and supplies, will develop rapidly.

It is not only the military forces but rather all the civil centers (communities) and all the native tribes which would benefit from it, and I do not doubt that aviation, which has perhaps frightened the Saharians less than was expected, constitutes a speedy and powerful means of penetration and pacification of the disaffected and rebellious territories.



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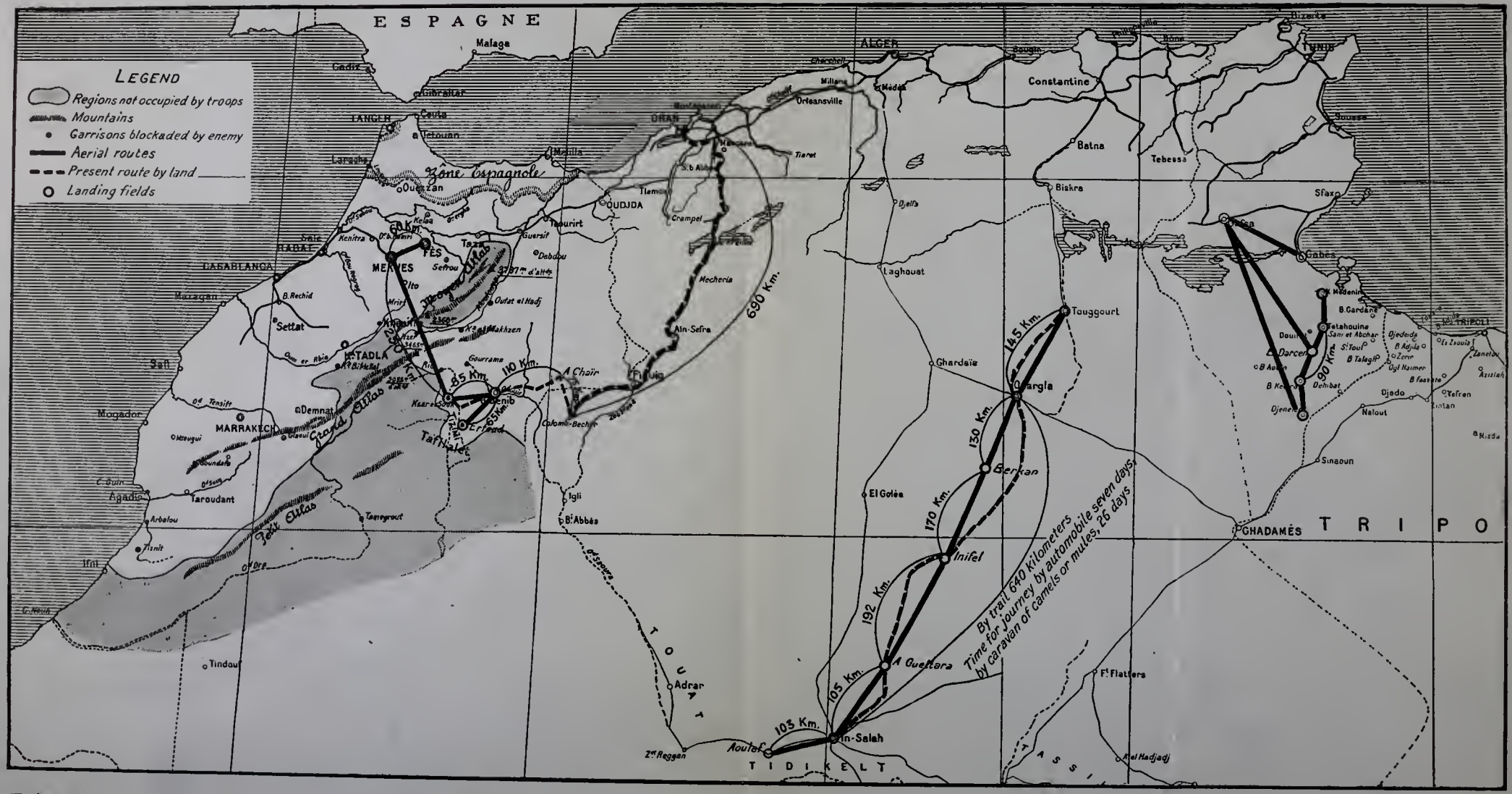

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THE SANITATION OF A FIELD ARMY

By Lieutenant Colonel HANS ZINSSER, M. C., U. S. A.

Sanitary Inspector, Second Army, A. E. F.

A BODY of troops is a community in which, in addition to organization for combat, provision must be made for all the needs of a civilian community, for supply of food and water, for shelter and warmth, for refuse disposal, for personal cleanliness and laundry, for care of the sick, and for all the other innumerable details that arise where human beings live in crowded places. The military sanitarian has some advantages over his civilian colleague. He has his community under more rigid control than the latter, and the individuals comprising it are young and hardy. These, however, are his only advantages. To offset this he is confronted with the difficulties that arise from the housing of many men in barracks, from the exposure and hard work that form the daily routine of their lives and, most important of all, from the fact that all his arrangements must be made with the clear recognition that there will be times when all considerations of health must become subordinate to the purposes for which his community has been formed, namely, the training for combat and battle.

In training areas and base sections, the problems of military sanitation are very similar to those of civilian work. In the case of an army occupying a front line sector, the conditions are modified by the many factors that active warfare involve. It is these latter problems that we wish to consider more particularly.

The organization of divisions is based upon the necessity for mobilty. A division is a spear which must be thrust and withdrawn as military needs indicate. It must be complete in itself and carry within its organization the elements of all the parts necessary for independent functioning. Often a gain in mobility involves an inevitable loss of efficiency, and the sanitary organization of divisions therefore must necessarily do without many of the arrangements that are possible only in a permanently organized territory with extensive laboratory facilities, bathing and disinfection apparatus, and all the other devices which are perfectly arranged only when more or less permanent occupation of an area is possible.

Divisions are gathered in corps, and the corps occupies an area. But as warfare was developing just before the armistice was signed, the corps was a tactical unit and its headquarters were changing

almost as frequently as divisional stations. Consequently corps areas were shifting to meet the rapidly changing necessities of strategy.

In the Field Army only can we, for the present, count upon the occupation of an area for a reasonably definite period; long enough, at least, to justify the undertaking of extensive organization and construction, with relation to territory occupied; and it is only in the army organization therefore, in which we can formulate a system of sanitation based on area, which can so reinforce the divisional organizations as to fill in the defects existing in the latter by reason of their greater mobility.

An army sanitary organization, under conditions of warfare such as those which, until recently, prevailed in France, should be so constructed that it combines careful sanitary scrutiny and control, with sufficient mobility to adapt itself to advances, to the shifting of flanks, contractions and expansions of the occupied territory.

When the British armies first entered the battlefields of Flanders, they had sanitary squads or detachments attached to divisions just as we had them in the old tables of organization. It soon developed that an army area is a section throughout which a continuous shifting and rearrangement of the composing element must take place. Divisions move forward into the line, remain in position for varying periods and are withdrawn for replacements and rest. Other divisions move forward from reserve positions to take their places. Artillery changes its emplacements; supply and ammunition trains, engineering detachments and labor troops move about whenever needed.

Within the more or less constant limits of the army area a continuous circulation of units takes place, a shifting of troops to and fro, an active wandering about like that of ants in a hill. It is apparent that there is much wasted energy and loss of efficiency if every division is required to organize its sanitary arrangements *de novo* whenever it is moved. The knowledge gained and the work done by one division are lost to the one that moves into its place, and a new investigation of water sources, billets, dumps, latrines, baths and everything bearing upon the control of disease becomes necessary whenever divisions change locations. It has been found, in consequence, that some form of constant central supervision by the army itself will remove these obvious defects. This is the prin-

ciple which underlies the British Army Sanitary organization and it is the system, in its essentials, that we have found worthy of emulation. We have borrowed from the British system certain essential elements, but have attempted to adapt these to the more mobile conditions which prevailed on all parts of the front during the latter months of the war. The following outline describes briefly the plan instituted in the Second Field Army, A. E. F., with the official approval of the commanding general. The plan is similar in most of its details to that conceived and carried out for the supervision of the advance section, A. E. F., by the chief surgeon of that section, but differs from this in the attempts made to remain prepared for sudden extension forward of the army area and the rapid organization of conquered territory.

OUTLINE OF PLAN FOR AREA SANITATION, SECOND ARMY

1. The army area is divided into administrative subdivisions to be known as *Sanitary Sections*. The area as at present constituted will be divided into three such sanitary sections, and in the future expansion or change in the territory occupied by the Second Army can be easily adapted to corresponding changes in the subdivisions.

In a central point in each sanitary section there will be stationed one commissioned officer, lieutenant or captain, Medical or Sanitary Corps, chosen for his training in practical sanitary methods.

Each sanitary section will be again subdivided into eight to twelve *sub-areas*. These will be so outlined as to be small enough to be patrolled on foot, thus obviating the necessity for additional transportation. Into each sub-area will be placed two or three enlisted men and noncommissioned officers chosen for their general intelligence and training in sanitary inspection. Further training will be given these men by the commissioned officer commanding the squads in each sanitary section.

It seems likely that a number of sanitary squads so selected can at the present time be obtained from personnel or divisional sanitary squads now assigned to the S. O. S.

Duties

1. Duties of the commissioned officer in charge of squad. The commissioned officer assigned to each area will:

(1) Maintain in the town of his station a sanitary school for the instruction of noncommissioned officers and enlisted men of sanitary squads, and a shop for the construction of sanitary appliances, such as latrine seats, etc.

(2) He will select and distribute men of his squad to the eight to twelve sub-areas in the section. He will direct and advise the work of the men in the sub-areas by receiving reports and keeping in constant touch with them by circulating in his area.

(3) He will keep in touch with all matters of sanitary importance in his section and furnish all such information to zone majors, medical officers and commanding officers of all units that enter the area.

(4) He will keep in constant touch with corps and division surgeons in his area, furnishing them all information at his disposal.

(5) He will be directly responsible to the chief surgeon of the Second Army through his sanitary inspector, reporting all matters that in his opinion need correction.

DUTIES OF SANITARY SQUADS

2. Sanitary squads will be divided into groups of about fifteen to twenty men who will work at the station of the squad commander, in the shop and in the Sanitary School.

The remainder will be assigned in groups of two or three in each of the small sub-areas.

The place in each sub-area at which they are stationed will be so chosen that from it they can patrol the entire area on foot. These men, under the direction of a commissioned officer, will—

(1) Keep detail maps of the sub-area, showing everything of sanitary importance—water sources, latrines, urinals, stables, cesspools, dumps, baths, lavoirs, kitchens, billets, barracks, camps, etc.

(2) They will inspect and keep in repair permanent sanitary appliances located in their sub-areas, such as latrine seats, baths, kitchens, etc., etc., drawing upon the sanitary shop of the section for labor and materials.

(3) They will keep in touch with the engineer water personnel working in the sub-area.

(4) They will, as well as possible, keep themselves informed of infectious diseases occurring in the civilian population in the sub-area and see that such disease is promptly reported to the proper medical authorities.

(5) They will furnish all information gathered by them to town majors and commanding officers of incoming troops as soon as they enter the area.

(6) They will report all sanitary defects which require attention to squad commanders of section.

(7) They will plan improvements of permanent sanitary installations and confer with the squad commander regarding them.

(8) They will report upon the condition of sub-area of parts of it whenever troops leave this area.

(9) They will exercise no administrative or other authority, their functions being those of inspection.

(10) Their maps will be kept up to date and copies furnished incoming troops and others whose health depend upon such knowledge.

(11) It should be understood that the enlisted men of sanitary squads are not labor troops. *i. e.*, they do not police or care for grounds, billets, and areas, or dispose of refuse. They function as assistants to the sanitary inspector of the Second Army.

These arrangements provide an adequate sanitary supervision, which serves the important purposes of keeping constant guard over the area occupied by the army, facilitating the tasks of incoming troops, obviating the necessity of frequent and useless repetition of sanitary surveys of the same territory and keeping the army authorities constantly informed of prevailing conditions and needs. By constant coöperation with billeting majors and with officers and men of the water service of the Engineering Department,

moreover, these squads form a coördinating link which serves to convey necessary information from one service to the other.

When the army area changes by advance or lateral shifting it is a relatively easy matter for the squad commander, whose area is adjacent to the newly-acquired territory, to extend his work into this. If complete change in the location of the army takes place, the squad commanders concentrate their men at a central point, move them forward and, after a rapid survey on their motorcycles, in consultation with the billeting officers of G-1, redistribute personnel. Such a shift should not require more than three or four days at the most, and as a matter of fact, when the system has once been thoroughly established and the personnel trained, the survey of a new area can be carried out with increasingly greater speed.

When the army is engaged in active combat it is best to exclude from the above scheme of organization a strip of territory about four kilos deep, immediately behind the trench lines. This area is subjected to shellfire, and any kind of constructive activity of a permanent nature is rendered difficult. In this area it is best to leave sanitary work entirely to the divisional authorities, in direct consultation with the army sanitary inspector, who should keep in close personal touch with the divisions in the line.

Relations of the Army Sanitary Office to the Sanitary Inspectors of Divisions

The army sanitary organization should not interfere in the slightest with the sanitary organization of the several divisions in the army. The routine sanitary supervision of divisional troops in all matters pertaining to health should be left, as hitherto, in the hands of division surgeons and division sanitary inspectors. It is the duty of the army sanitary inspector and all the machinery at his disposal, however, to reinforce the divisional facilities, to advise the responsible divisional officers and to place at their disposal the experience and knowledge he may have gathered by reason of his intimate acquaintance with the area. The army sanitary inspector should be a man not only trained in field sanitation but one who, by experience in laboratory and epidemiological work, can reinforce the divisional facilities whenever infectious disease of any kind occurs. Whenever infectious disease is reported from divisions in more than isolated, unrelated cases, the army sanitary inspector should confer with the divisional sanitary inspector, examine the prevailing conditions and advise. It is he who, either in person or through trained assistants, should make epidemiological studies and laboratory studies whenever these seem indicated for the purpose of arresting the spread of contagion. He should be the adviser of the chief surgeon of the army in matters of sanitary policy, in circularization of information, and in the meeting of any emergency. It is his duty to organize the area, supervision and the transmission of information concerning the areas to incoming divisions. It is his function to establish and maintain liaison between the divisional authorities and other services of the army which have bearing on sanitary problems such as the water service of the engineer department and the bathing and disenfestation activities of the Quartermaster Department.

To carry out these functions he must have: first, transportation; second, assistants and personnel for area organization; third, a system of report

whereby he can keep records of the daily occurrences of communicable disease in all units of the army.

His functions, thus defined, do not in any sense curtail the authority or diminish the responsibilities of the divisional medical authorities.

The question of the proper personnel of the army sanitary organization will be tabulated below.

Reports

It is necessary for the sanitary inspector of an army to keep constantly informed concerning the prevalence of communicable diseases in all troops of the army, both those in divisions and those designated as army troops. For this purpose he must maintain in his office some kind of a reporting system whereby he can constantly keep his hand on the pulse of the sick rate. In working out a system of reporting for active army organizations it should always be borne in mind that unit commanders and medical officers are often overburdened with paper work and that the multiplication of such duties may interfere seriously with their more important function, namely, the actual execution of the duties they are asked to report upon. For this reason, whenever outlining a system of report, one should scrutinize each report demanded as to whether it is actually one which will furnish information on a basis of which action can be taken. Provision is already made in Army Regulations for routine reports of many kinds, and the routine information which is really needed is constantly passing through the proper sources automatically. What the army sanitary inspector needs to know is whether contagious diseases are occurring, when and where, and in which company units.

The company unit is important because it indicates occurrence in groups which are eating and living together, and therefore this report gives information as to contact. Knowledge of the place where the disease occurs is very important when troops are stationary, less important when they are constantly moving about in an army area. But, nevertheless, even here the place is of value, since the occurrence of a considerable number of cases in one and the same place within a limited period may point to faulty condition of barracks, billets or water-supply. The system which has been worked out and is in use in the Second Army is simple and gives the necessary information.

Paragraph 12, Manual of Sick and Wounded Reports, A. E. F., September 15, 1918, provides that special daily telegraphic reports of admitted communicable diseases must be sent to the chief surgeon, A. E. F., by all field, evacuation, camp and base hospitals. Report must give name, rank, company and place of origin of infection whenever possible. For the purposes of the individual Field Army it is sufficient to require duplicate telegrams from all the field and evacuation hospitals in the army and to request similar duplication of telegrams from any base hospitals that are situated so close to the army area that they may receive patients direct from army units without their passing through field and evacuation hospitals. On receipt of these telegrams, an assistant in the office of the sanitary inspector takes them each morning to the statistical office of the Army, checks the location of the units from which the diseases were reported, and then lists them and records the information in the following manner:

(*a*) *Record by Units.*—A book is kept in which separate pages are so lined that cases of epidemic diseases can be entered by date and company, one page being given to each unit in which the disease occurs. An example of such a page is as follows, the letters in the squares representing the code adopted for the brief designation of different diseases (see page 452).

(*b*) *Spot-Map.*—A wall map of the entire army area is kept, and when an infectious disease occurs a pin is stuck into the location from which the disease is reported, pins with a variety of colored heads used for different diseases. Each pin is thrust through a little square of paper on which are written the date and the unit. When the area is one of an army actively engaged in combat, in which units are moving to and fro with great rapidity, the knowledge of the place from which the case is reported loses value by virtue of the fact that the disease was probably not contracted in the place from which the report comes, and that by the time the patient has been in hospital two or three days this unit may have moved to another location. The spot-map can, nevertheless, be made of value by the following procedure. At the end of each week the information found on the spot-map is entered in a book. In this way there is constructed a record of all places in which infectious diseases have occurred during the week. When this information has been entered in the book for the past week the pins are taken out and replaced with common pins (without colored heads), which are left to form accumulated evidence of all infectious diseases that have occurred in each place. When a large number of such pins accumulate in any single space, it is simple, by going back to the book in which the diseases are kept by places to find out which particular variety of disease has occurred there. Beginning with the new week, the colored pins are again entered as before. The map, thus, at all times, shows not only the nature and location of the disease occurring within the week, but also indicates by a massing of the common pins whether or not these places have been frequent sources of disease. After a while it is of value to study the movements of units in which infectious diseases have occurred and draw lines across the maps with red or blue pencil along the paths of movements followed by these units. This can easily be done by reference to the information in the "unit" and "place" record, and it may occasionally be found that lines drawn for infected units may intersect at places at which a considerable number of infectious diseases have occurred. By putting in dates it may sometimes be discovered that a unit which has reported communicable diseases has passed through places from which similar cases were removed from other units, within periods representing incubation times.

As implied in the above, a further record, arranged by places, is kept in an ordinary ledger in such a way that there is a page for every town in which a communicable disease has occurred, and all cases reported from these towns are entered on this page.

To summarize, we then have a cross-indexing of records as follows: (1) Record by units from which contact studies can be made; (2) map record of places, as described above; (3) a ledger in which the occurrence of diseases is recorded by place of occurrence;

No. 170–5½.
Office of the Chief Surgeon
2nd Army.

NOVEMBER, 1918

Sanitary Inspector's File of Epidemic Diseases by *organization.*

CODE:
Chicken-pox.....C.P.
Cholera.....C.
Diphtheria.....Di.
Dysentery.....Dy.
German Measles.....G.M.
Measles.....M.
Meningitis (c.s.).....Men.
Paratyphoid fever....P.F.
Plague.....P.
Scarlet fever.....S.F.
Smallpox.....S.P.
Typhoid fever.....T.F.
Typhus.....T.

The station entered at bottom of each sheet is corrected daily from the revised list of the Statistical Office.

Date	COMPANY																
	A	B	C	D	E	F	G	H	I	K	L	M	H Q	MCH GUN	SUP COM	SAN DET	
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10						Men.			Men.								
11										M						M	Band
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ORGANIZATION 56th Infantry

Nov. 10 at Bouillonville. Nov. 18 at St. Marie Farm.

(4) a week-book in which weekly records of the map are preserved after the renewal of pins.

In addition to these records constant contact should be kept with divisional surgeons and sanitary inspectors and medical officers of army troops, who are requested to communicate directly with the sanitary inspector of the Army when they wish advice on any sanitary matters, or when any of the units under their care show the occurrence of infectious disease which they regard as warranting remedial action. Such an arrangement, especially if the sanitary inspector has the confidence of the officers involved, forms an indispensable check on the records described above and makes it possible also to keep in touch with the occurrence of diseases which it is unwise to designate as "reportable." Such, for instance, would be influenza. When a few isolated cases of so-called influenza occur they have very little sanitary importance, and reporting them would needlessly encounter the paper work. When influenza occurs as an epidemic, the cases are usually so numerous that telegraphic reports are not feasible. In this disease and few others, therefore, we must rely on the direct information by contact with the officers in charge, with whose coöperation intensive study of the situation must be made when epidemic conditions prevail.

The activities of an army sanitary department are, in other words, analogous to those of the combat branches. A routine of reliable information must be established on the basis of which the needs of ordinary times can be attended to, but this organization must be sufficiently elastic and possess sufficient reserve margin to detect promptly and to be capable of reacting by special efforts to emergencies of sudden changes that may occur.

LABORATORY AND EPIDEMIOLOGICAL SERVICE

Just as the laboratory is of partial efficiency only in hospitals if the bacteriologist is unfamiliar with the cases in the wards, so in armies the laboratory service cannot be entirely efficient unless the laboratory officer is trained in and in touch with the epidemiological data. For this reason the Sanitary Inspector of the Army, who should be capable of acting as an adviser to medical officers and sanitary inspectors of the several troop units, should be a man not only trained in practical sanitation but one who at the same time is familiar with the facts of epidemiology, the methods of making epidemiological surveys, and can handle a laboratory for the control of communicable diseases as an important tool of his profession.

The laboratory organization of a Field Army when the army is holding a definite sector should consist of a stationary mobile laboratory within reasonable proximity to army headquarters. This main army laboratory should be equipped for all cultural work and have a personnel consisting of at least two or three commissioned officers and five enlisted men, three of whom are trained technicians. Attached to this army laboratory there should be one to two mobile laboratory cars equipped as are those now in the A. E. F. or those designed by the British for army use. When the army is moving as in a rapid advance or is changing its areas for other reasons, the two mobile laboratories may suffice. Each mobile laboratory should have, as personnel, one bacteriologist, one driver and one trained technician. There should be with it a motorcycle which can be used for the collection of specimens and for epidemiological studies. The station army laboratory should also be a supply laboratory for the mobile laboratories which proceed from it as a base on special trips.

It is doubtful, at the present time, whether the divisional laboratories, as formerly organized and equipped, should be continued. When divisions are reasonably stationary, such laboratories can be of great value for the performance of clinical pathological work for field hospitals and can materially aid in the speed and detection of communicable diseases, more particularly meningitis, diphtheria, amebic dysentery, malaria and tuberculosis. Such a laboratory should never be equipped for extensive laboratory work, for, when divisions are moving or actually engaged in combat, insuperable transportation difficulties invariably arise. Moreover, under such circumstances patients who are sick for more than a few days are evacuated to hospitals where laboratory facilities are available, and the largest epidemiological problems can best be handled under any circumstances by the mobile army laboratories described. The bacteriologist in charge of these cars can be trained by the army sanitary inspector to make epidemiological studies and, thus utilized, can independently attend to the rapid contact and carrier studies which should be made in direct coördination with the actual laboratory work. It is our belief that a thorough laboratory training is essential to work in epidemiology. The divisional laboratory man should be utilized in the same way as special assistant to the divisional sanitary inspector.

In discussing laboratory work in field armies it should always be borne in mind that an army engaged in combat or holding a

sector is not the place for research. The laboratory should be an instrument in the hands of sanitary authorities for the prompt detection and arrest of communicable diseases. For these reasons, it is of great import that we should consider briefly the extent of laboratory work which it is wise to carry out in active field armies.

The most practical solution of the clinical pathological problems for divisions would seem to me to maintain a number of such organizations for assignment to divisions when circumstances are such that the laboratory can functionate to advantage. These laboratory units, organized as at present, could remain under the control of the Director of Laboratories of the Army and assigned to divisions for indefinite, temporary duty when the respective divisions are at rest, assigned at the request of the division surgeon, and withdrawn and unassigned wherever needed when the particular division is in combat or moving.

It goes without saying that mobile laboratories and all purely diagnostic laboratories which are connected with an army organization should at all times be carefully supervised in order that the promptness of diagnosis which gives the clue to epidemiological investigation and control shall be efficiently carried out.

One of the fundamental principles underlying successful epidemiological laboratory work is to restrict it to the amount which can be accurately done. We are entirely out of sympathy with the extensive carrier examinations which were instituted in the camps of the United States for the control of meningitis upon the occurrence of a single case. Our own observations have not given us the impression that this work has had much effect upon the reduction of the disease incidence, and we are absolutely sure that the technical inaccuracies inevitable in such wholesale bacteriology largely defeat the purpose of the work.

It is, in our opinion, more important to restrict the laboratory work at first to rapid and accurate diagnosis, and to abstain from extensive carrier work until a number of cases have occurred in one and the same unit. The principles of prevention of most of the diseases of importance for army sanitary control are fairly well understood, and after the discovery of a single case in a unit it is more important as a rule to concentrate speedily upon the correction of general sanitary defects for the control of the particular disease. Most of the important military epidemics are either of respiratory, digestive or of insect transmission.

For sanitary purposes we consider as respiratory in mode of

transmission: Pneumonia, influenza, measles, scarlet fever, meningitis, diphtheria, mumps, chicken-pox.

Diseases transmitted by the digestive route are typhoid and paratyphoid fever, the dysenteries, simple diarrheas.

It is not possible to generalize intelligently when speaking of different diseases. For this reason the principle of epidemiological and laboratory procedure, which we believe sound and effective, can best be presented by submitting in more or less detail our reasoning and actual methods of work for each disease in question. Some considerations leading to our method of handling meningitis will be pertinent as illustrating our point of view.

Epidemiologic records almost universally show that in very few instances is a case of meningitis directly referable to a preceding one, as is the case in measles, smallpox, etc. Almost universally divisions that have meningitis show a scattered distribution, there being often as many individuals, or almost as many, involved as there are units, and when the cases are so plentiful that several or many occur in the same company or platoon it is almost exceptional (though obviously it must occasionally occur) that direct connection between one case and a preceding one can be established.

This shows with great definiteness that in the transmission of meningitis the carrier is of comparatively greater importance than the case.

It also shows that the disease is one to which the susceptibility of individuals varies within very wide margins, otherwise we would frequently find, as in typhoid fever and other diseases, groups of cases radiating back to the same carrier source. Such, however, is not the case, and it is this that I mean when I say that here is a phenomenon—the incidence of meningitis is more a susceptibility than a transmission problem.

It will be well for purposes of practical army sanitation to classify disease according to susceptibility phenomena. There are some diseases like typhoid, typhus, smallpox, plague, cholera, measles, scarlatina, and some others to which susceptibility is universal, and all individuals who have not had these diseases or have not been artificially protected are likely to contract them if exposed to a sufficient dose of the virus, that is, to a minimum infectious dose. There are other diseases like pneumonia in which the normal human being, well fed, well clothed and not otherwise diseased is highly resistant and will withstand, without harm, exposures that will infect promptly his fellows less cared for or for other reasons

in poor physical condition. In the former class the sanitary measures must always primarily consist in contact prevention by the discovery and removal of cases and carriers, combined with the supervision of intermediate means of transmission and specific vaccination. In the latter group of diseases the contact matter must of course also be kept in mind, but the primary point of attack must be the general hygienic measures that aim at the prevention of resistance-lowering conditions. In the case of meningitis we are dealing with a disease in which normal resistance is probably high in most individuals. There exists, however, a group of individuals who, for reasons not hitherto clear, are abnormally susceptible, this susceptibility being a permanent, perhaps congenital property with them, diminishing with adolescence in some of them, remaining with others, increasing with all of them when general physical environment is poor. That such diseases as influenza predispose to meningitis is probable, as recent experiences seem to indicate. The supposition that there are individuals who are normally susceptible to meningitis is based on facts observed by all who have dealt with this disease. In all epidemics there are many individuals who, though in perfect health and remarkably good physical condition, develop the disease and die rapidly, while others may harbor meningococci in nose, throat, and even lungs, but escape meningitis.

Whether or not such relative immunity depends upon an acquired resistance, whether it is measurable by serum or skin reaction, these are interesting fields for investigation, but too little is known at the present time concerning this to allow us to discuss it.

The carrier problem in meningitis, moreover, differs from that in typhoid fever and some other diseases in important respects. A typhoid carrier is apt to be a chronic carrier. In meningitis it is apparent, from the excellent studies of the British and some of our own, that carrier rates, in one and the same troops unit, fluctuate between very wide limits. During the warm months, when meningitis incidence is low, the carrier rate is correspondingly low. During the autumn and winter months, coincident with the spread of catarrhal conditions of the upper respiratory passages, the carrier rates go up even to 20 per cent and above.

In the face of these simple facts let us consider how meningitis epidemics come about, why they occur, and in what respect the occurrence of such epidemics differs from those of such diseases as measles, typhoid fever, etc., and other diseases to which all previously uninfected individuals are susceptible.

In any command, at any given time, there is a definite percentage of susceptibles and there are a number of carriers, varying according to the prevalence of upper respiratory catarrh and degree of crowding of the command. When the command is first organized, if chance brings these two groups into close association with one another, a few cases of meningitis occur. Sooner or later the command settles down to a more or less regular routine of reciprocal contact between definite groups of individuals associated in fixed platoons and companies, billet or barrack companies. It is summer, and there is little catarrhal disease. Men do not spread saliva by sneezing and coughing; if occasionally they do, the relatively healthy mucous membranes of the recipients do not form a favorable nidus for a flora of organisms so delicately vulnerable to symbiotic conditions as the meningococcus. Then come cold weather, exposure, etc. Carriers acquire colds and begin to secrete and spread mucus; their meningococci become more plentiful on the diseased mucosae and are brought down from the high places in nasal sinuses; the men begin to crowd together about stoves and sleeping quarters. Other men similarly diseased become carriers. The carrier rate goes up and, with it, the mathematical changes of contact between susceptibles and carriers increase at more than geometrical ratio. Moreover, more men become susceptible because of influenzal or other infections of the nose, throat and bronchi.

With these facts as a basis, how should we handle meningitis in military units? It seems to me utterly useless to attempt to take out all carriers by examining bacteriologically entire regiments or divisions, as has been attempted in the past.

The following circular illustrates the procedure as adopted in the Second Army, A. E. F., for the management of meningitis, as based on the preceding considerations.

The following measures should be taken when meningitis occurs in the command:

1. When one case of meningitis appears in a unit, make a thorough sanitary inspection of the unit and enforce with great strictness the existing regulations concerning space between beds, ventilation and mess-kit washing. Nothing else need be done.

2. When two or more cases occur within the same ten days or two weeks, in addition to the above have all men inspected at least once a day and remove all those with severe colds and coughs from sleeping quarters, screening them from each other with shelter-halves hung between beds; if necessary, screening of the part of the barrack in which they are put from the rest of it, preferably putting them together in a separate building. Treat coughs and colds as things requiring the attention of the medical officer

as though they were really dangerous sources of infection to others. Other matters of inspection, such as cleanliness of floors, spitting, etc., go without saying.

3. When two or more cases occur in quick succession in such a way that one can reasonably become apprehensive of an incipient epidemic, the following measures should be adopted:

Carry out strictly all the provisions incorporated in the preceding paragraphs; regard the command as probably badly infected and take great pains to separate out the coughs and colds. Do your utmost to find facilities for additional quarters and spread the men out in small groups or allow as much more space as possible beyond the minimum required. If necessary, put some of the men under tentage or in pup-tents, giving them extra allowances of coverings. The argument that this cannot be done in the whole A. E. F. is invalid because this command is to be managed as an infected one. Have a noncommissioned officer supervise mess-kit washing in boiling water. Inspect quarters during the day as often as seems necessary according to discipline of the command, and at least once during the night for ventilation. Notify the Office of Chief Surgeon, Second Army, immediately, so that army laboratory may undertake to do carrier rate examinations on the command. Preventative measures beyond those stated above will depend upon the result of laboratory examinations.

The following Sanitary Order, Second Army, A. E. F., will illustrate our opinions as to the proper balance to be struck between the employment of general sanitary measures and laboratory investigations in the actual control of epidemics in an active field army. The section on meningitis incorporated in the original is omitted to avoid repetition.

REGULATIONS FOR THE CONTROL OF COMMUNICABLE DISEASES, SECOND ARMY, A. E. F.

The following circular is issued for the guidance of medical officers of the Second Army in their most important function—that of preventing communicable disease.

The sense in which the words "quarantine" and "contact" are used is first defined in order to avoid ambiguity.

It is impossible to lay down ironclad rules applicable to all conditions. A certain amount of discretion must be left to the medical officer in charge. In making recommendations both military necessity and medical expediency must be considered. Military duties and training must be interfered with as little as possible. In making recommendations, it is advisable to put them in such form that they may be issued directly as an order.

Definition of Contacts.—The following will be considered contacts: (1) Men in same tent; (2) men in the same room in billet; (3) men in same barracks, who have been sleeping within three-bed distance on either side of patient within the last ten days; (4) those men who have been in particularly intimate association with a case during the probable infective period.

Definition of Quarantine.—Quarantine may be of two degrees: (1) absolute; (2) partial or working quarantine.

Absolute quarantine. Men are strictly confined to a definite area and all association of any kind with others is forbidden. This is only applied in very serious diseases, such as smallpox, typhus fever, plague, etc., or where the extent and degree of the epidemic warrant strenuous efforts for its control. A guard is usually necessary.

Partial or working quarantine. Troops are allowed to attend out-of-door formations. It is preferable that they be drilled or worked separately, but when this interferes with military training, it need not be insisted upon. When off duty they are to be kept absolutely separate from others, messing alone or at a different hour and washing their mess-kits in separate boiling water. It is the type of quarantine usually employed.

I. GENERAL PROCEDURE

(*A*) Measures to be taken immediately when respiratory disease occurs. In this category are included pneumonia, influenza, measles, scarlet fever, meningitis, diphtheria and mumps.

1. *Quarters.*—Inspect quarters to determine overcrowding. The ideal to be aimed at is a minimum floor space of 4 by 10 feet per bed. Under no circumstances ever allow less than 20 square feet and, if this seems impossible of attainment, report immediately to higher sanitary authority (Bulletin 94, H. A. E. F., 1918). Make sure that all the available space in your billeting area is in use and that there are no unoccupied rooms or barracks while others are overcrowded. When the space allowed is less than 4 by 10 feet hang up shelter halves between beds by stretching strings from wall to wall. Under all circumstances enforce head-to-foot sleeping. When double-deck bunks are provided, try to allow 5 feet between individual bunk units. Separate the two men sleeping on the same tier by shelter-half partitions. Be sure that men across aisles are sleeping head to foot. Not more than 50 men should go into an Adrian barrack. During warm weather shelter tents should be used in preference to crowded barracks.

Ventilation must be strictly enforced and inspections made at least once between taps and reveille to enforce the keeping open of windows. Blankets and bedding will be aired for several hours on dry days. Spitting in quarters will be made subject to disciplinary action. Floors of sleeping quarters will be swept after sprinkling with water once a day.

2. *Mess-kits.*—Mess-kits must be washed in boiling water. The mess-kit water should be kept on the fire and kept full of soap suds. Rinse in running water. Do not dry on a common towel. When no fuel is available it is better for the men to wash individually in running water, wiping out with paper or leaves than to wash in the common lukewarm can of diluted saliva.

3. Inspect men twice a day, once at roll-call, once at retreat. Look them over for colds in the head, red conjunctivae, coughs. Ask a few pertinent questions. Take temperatures of men who are not feeling well or who have severe colds. Segregate those with colds and coughs by putting them into separate sleeping quarters. If no such quarters are available, separate a part of one barrack or large billet by making a partition of suspended blankets. Hospitalize all the cases with temperature.

4. Investigate equipment of men with especial attention directed to supply of overcoats, raincoats, serviceable shoes, three blankets per man and three pairs of socks.

(*B*) Measures to be taken when intestinal disease appears, typhoid, paratyphoid, dysentery, or epidemic simple diarrhea:

1. Inspect latrines. See that they are not too full, that the seats and covers are tight and that there is no trickling where bottom of box fits on the ground. When materials are available, have latrines burnt out once a day. Fill up all that are too full and have new ones dug not less than 5 feet deep. If no lumber is available for covered latrines, see that there is a pile of dirt and a shovel on hand, and either inspect frequently or put a guard on the latrines to make sure that the men cover every defecation and soiled paper with dirt. If available, wash woodwork once a day with a solution of cresol, a pint in two buckets of water, and sprinkle residue of this on feces. Sprinkle inside of latrine once daily with chloride of lime, if available. If epidemic conditions prevail, have wash basin and soap handy and force every man to wash his hands after defecation. Supply no towels. Hands should be allowed to dry in the air.

2. Inspect kitchens and enforce cleanliness in the handling and preservation of food. See that meat is protected from flies. Stop the use of salad, fruit, milk or other uncooked food. Enforce the washing of hands of kitchen personnel before the handling of food. In permanent camps, kitchens must be screened. Inspect kitchen personnel and remove those who have intestinal symptoms.

3. Attend to water supply. Personally assure yourself of proper chlorination of water and the cleaning of carts if water carts are used. Request bacteriological analysis of sources from which the water is taken after chlorination. If necessary put guards on public water supplies, faucets, etc., and instruct men concerning the dangers of unauthorized sources.

4. See that garbage, offal, the dead bodies of horses, etc., are promptly buried to reduce fly-breeding. Have manure piles removed, covered or packed tightly.

(*C*) Notify commanding officer of organization of existence of an incipient epidemic.

II. SPECIAL PROCEDURES

Sanitary Management of Meningitis

1. The following measures should be taken when meningitis occurs in the command:

(*a*) When one case of meningitis appears in a unit, make a thorough sanitary inspection of the unit and enforce with great strictness the existing regulations concerning space between beds, ventilation and mess-kit washing. Nothing else need be done.

(*b*) When two or more cases occur within the same ten days or two weeks, in addition to the above, have all men inspected at least once a day and remove all those with severe colds and coughs from sleeping quarters, screening them from each other with shelter-halves hung between beds; if necessary, screening off the part of the barracks in which they are put from the rest of it, preferably putting them together in a separate building. Treat coughs and colds as things requiring the attention of the medical officer as though they were really dangerous sources of infection to others. Other matters of inspection, such as cleanliness of floors, spitting, etc., go without saying.

Diphtheria.—On occurrence of a case of diphtheria, contacts will be put under working quarantine and a request made on the chief surgeon of the Army for cultural examinations and Shick tests on the contacts and on the kitchen personnel of the unit in which the case has appeared. Carriers will be isolated and recultured after a week. Extent of cultural examination beyond this will be determined by the sanitary inspector after an epidemiological survey. The entire command will be inspected at least once a day for sore throats. Positive Shicks will be given 1,000 units of diphtheria antitoxin. The administration of diphtheria antitoxin, with date, should be entered on the service record.

General measures given above, concerning quarters, mess-kits, etc., will be carried out.

Measles.—In addition to the general measures advised above, all contacts will be isolated in working quarantine for two weeks. The most important measure in the limitation of measles is the inspection of men at least twice a day, the prompt segregation of all men with colds or inflamed conjunctivae and the prompt hospitalization, as suspects, of all men showing temperature of 99.5 or above, by month.

Scarlet Fever.—In addition to general measures a working quarantine of all contacts for two weeks. Inspections as in measles. Especial attention to sore throats and temperature and segregation of those with severe "colds."

Liberty Measles.—As in measles.

Mumps.—Working quarantine of all contacts for three weeks. Daily inspection with especial attention to swelling of parotids and submaxillary regions, and inquiry as to sore throat. Temperatures taken on all suspicious cases and men with temperature hospitalized.

Smallpox.—Absolute quarantine of entire unit. Revaccination of entire unit. At least two negative tries must be made. Daily inspection as above and release from quarantine two weeks after completion of revaccination.

Typhoid and Paratyphoid Fever.—(1) Inspection of the command from which the case has come, especially in regard to the water supply, latrines, kitchen and sources of food, etc., as listed above; (2) scrutiny of the vaccination records of the entire unit; (3) carrier investigation of the kitchen personnel requested; (4) attention to fly protection and breeding.

Nothing further will be done beyond the correction of sanitary defects unless a second case occurs in the same unit. When another case occurs in the same unit, repetition of the carrier examination on the kitchen personnel will be made and the entire unit revaccinated with one dose of triple lipo vaccine.

Dysentery.—Same procedure as in typhoid fever, with particular attention to fly-breeding, latrines and the protection of food. Kitchen personnel cultured for the carrier state.

Amebic Dysentery.—Same as above, with particular attention to the discovery of carriers. This problem should be referred to the army laboratory through the chief surgeon.

Trench Fever and Typhus Fever.—Cases that suggest these diseases should be immediately reported, even if diagnosis is doubtful, and measures taken to have entire command deloused immediately. If there is difficulty in doing this, the problem should be reported to the chief surgeon of the Army. If there is a case suspicious of typhus fever, the entire command

should be put under strict quarantine until satisfactory delousing has been accomplished and several careful inspections for lousiness have been negative at intervals of one week. Typhus suspects should be evacuated in a separate ambulance, the cases marked as suspicious of the disease, and all blankets, clothing, etc., on the patient or in the ambulance must be deloused.

Influenza and Pneumonia.—Principles of prevention. The principles of prevention consist in: Supplying of men with sufficient clothing and covering at night and keeping them as dry as possible. Each man should have three blankets or a suit of heavy underwear, three pairs of socks, two pairs of shoes, one raincoat, one shelter-half, and sweater.

The avoidance of crowding in quarters and billets, and the provision of ventilation, as per "general procedures."

Care in the washing of mess tins in boiling water after meals.

The prompt exclusion of men with colds in the head from common sleeping quarters and the undelayed removal from companies of men showing the first signs of definite disease.

The evacuation of these sick cases separately from wounded and from those with other diseases.

Proper care and segregation in hospitals.

The first is a quartermaster's problem; the others are medical problems. All are disciplinary problems. *Coöperation is therefore necessary, and with it suppression of the disease is possible.*

These matters must be supervised by systematic inspection:

Dryness.—A wet man invaribly is cold a,nd a cold man is susceptible to infection. Three or four tin stoves in a dugout or a small hut make an excellent drying room. Strings and nails in them make it possible for men to hang up their extra clothes to dry. They can then go to bed with dry things or have dry clothes to put on in the morning. A drying room per platoon or company can easily be arranged with a little ingenuity and is of great sanitary importance, to say nothing of comfort.

Work.—When influenza is spreading rapidly in a command it is wise to remember that when men are overworked to the point of exhaustion they are rendered extremely susceptible to infectious disease. It is advisable. therefore, if military conditions at all permit, to ask that the drill schedule and other work be slightly reduced until the epidemic is under control.

Inspection and Segregation.—When cases of grippe have begun to appear the medical officer should attend roll-call and rapidly *inspect all the men every morning.* This can be done with speed by walking down the line, observing men for signs of "colds in the head," coughing, sneezing, or red eyes, and asking a few questions. Suspicious men should be made to step out and sent to the sick call, where temperature should be taken.

Men with definite colds in the head, without temperature, should be taken out of their billets and made to sleep in special barracks or billets, or other available space, with shelter-halves hung up so as to form screens between neighboring beds. If possible, they should be given an extra allowance of bed covering. They should be placed on light duty for a day or two. If no special quarters are available for such men, put them all together at one end of the barrack and separate this end from the rest of the barrack by hanging up blankets or in some other way making a screen.

Where the military situation will permit, cases of influenza may be hospitalized in the divisional area. The attack is shortened and complication prevented by early bed treatment.

Ample floor space must be allowed and screening between beds attended to. Gauze masks should be worn by patients and attendants when coming into intimate contact, especially during transfer and evacuation. Cases whose temperature continues for more than forty-eight hours, or with signs of pneumonia developing, should be evacuated except from such hospitals as have been designated by the chief surgeon, Second Army, as respiratory disease hospitals.

On all men showing temperature on first inspection careful chest examination should be made. If any signs pointing to extensive bronchitis or actual pulmonary involvement are found, the patients should be promptly evacuated.

Evacuation.—During evacuation, grippe cases should not be placed in the same ambulance with wounded or with other sick. Remember that. in evacuating pneumonia, the greatest care must be taken to *prevent their exerting themselves.* Do not let them walk or dress or undress themselves. Keep them on their backs. Failure to observe this may make the difference between recovery and death.

Hospitalization.—In evacuation and other hospitals, grippe cases must be placed in separate wards.

Cases developing pneumonia must be taken out of the grippe wards promptly and placed in separate pneumonia wards. Beds must be screened one from the other. Attendants must wear light gauze masks. Sputum must be disinfected or burned. Thermometers must be sterilized.

(To be concluded)

LENGTHENING OF STUMPS

By Major FRED J. COTTON
Medical Corps, United States Army

(With three illustrations)

ONE OF the things we have been doing industriously is the shortening of stumps already short enough. In civil life this is not so bad, for there is apt to be a little leeway in length, but in military surgery it is a crime to sacrifice even a fraction of an inch. Wounds in this war are of such a character that open amputation of the guillotine type must be the common procedure. Necessarily the results are defective as compared with those of deliberately executed flap operations; the proportion of close adhesions of scar to bone is high, and though we are not getting any considerable ratio of neuromata or of irregular bone growths, there are a good many cases calling for secondary operation.

The typical condition is that sketched in the accompanying drawings—a crimping in of the flaps to a depression over the bone end which is thinly covered with sensitive, easily traumatized scar (Fig. 1a). The common problem is simply that of doing away with this depression without loss of length; at times we have a conical stump to cover over (Fig. 1a). If this can be done by simple plastic work on redundant flaps, so much the better. These cases call for no discussion.

My only contention is that, if the flaps are not redundant—they usually are not—instead of sacrificing bone we cannot spare to fit the short flap, we should transplant sufficient tissue from some place where it can easily be spared to meet the need.

Fortunately such spare tissue is abundant enough and usually accessible. We have in the two-stage transplantation of skin, of fat, and if need be, fascia as well, a technique easily adapted to this problem. It seems odd that the scheme has not been used or that it should be necessary to urge its use. Probably the accidents to which these grafts are subject if the technique is inexact, and the fact that orthopedic surgeons do not readily think in terms of grafting, may serve as an explanation in default of a better.

The remodeling of a thumb stump (Fig. 2) is my only clinical case to date. The technique of these two stage transplants of thick flaps, originating with the ancient Indian method of rhinoplasty, is familiar to those of us who have had industrial surgery to do, be-

cause of its use in providing a flexible covering where ordinary skin grafts are useless (as in operations for contractures in the palm of the hand, in covering a denuded heel, etc.), and may readily be brought by any good operator to almost perfect efficiency.

There seems to be no practical limit to the size or thickness of the flaps that may be transplanted in this way, so long as only skin, fat, and fascia are taken. Nor need we be too greately concerned about conditions of nutrition in the surface to be covered, provided only that the edge apposition is exact and the preliminary excision of scar extensive enough to give a fair chance for the formation of new vessels. I suspect that the amount of nourishment coming through the bottom of the flap is of secondary importance and secondary in time as well.

Certainly only since I learned from failures to be exact about apposition of graft edge to radically refreshed wound edges have I had near 100 per cent of "takes"; neglect of this detail is probably the main cause of failure.

A second cause of failure is neglect of hemostasis with subsequent hematoma formation under the flap. This matter of hemostasis is not quite easy, for one must do it by crushing with the tips of forceps. It is unallowable to leave any ties or sutures underneath the flap—sinus formation would be certain.

As to the ground, it does not seem to matter greatly. I have had good fortune with flaps laid over bone barely showing granulations through its substance and over considerable areas of freshly denuded tendon and other dense fibrous tissue; fresh surfaces—fresh wounds—do not seem to be a favorable ground. No doubt the increased nutrition of a surface already covered with granulations or the great vascularity persisting for some time in scar areas accounts for this.

Asepsis seems less important. Provided a wound has no infected pockets and the general surface is decently clean, sepsis is not apt to be a great factor. I have always, when possible, performed a preliminary cleaning and disinfection, then scrubbed or trimmed away the surface granulations and cleaned off again, using alcohol disinfection. One can hardly do more.

The place from which the graft is to be taken is a matter determined by convenience of access to the part to be covered. For a heel or leg stump the opposite calf is desirably chosen; the thigh would be better, but to keep contact would necessitate an unbearable position of the limbs. (One may, of course, make a transplant

first to an intermediate, accessible field, where the flap gets its hold, is cut loose from its base and is then transplanted to its final site. This is sometimes done in rhinoplasty, but is hardly worth while for our present purpose, to say nothing of the less certain result.) For the hand or forearm one has the choice of the abdomen, or the loose skin of the flanks, or the heavier tissues of the loin. For the upper arm the pectoral region gives a source of supply. One can get the flap pretty much anywhere, but in certain places the fat is rather thin, and where the tissues are tight it is not easy to close the wound under the flap at the first operation so as to get a quick healing after the flap is cut loose. As to the pattern of the flap, only one rule is important. Get it big enough. When it is freed it contracts about a third in each direction, and during the time we wait it contracts still more.

The direction of the pedicle is one of convenience in arranging fixation, not important as to sufficent nutrition. One is more likely to leave too good a pedicle than not enough. I cannot recall ever seeing a flap suffer from insufficient blood supply between the first and second operation, but have at times had to make two steps of the cutting loose (with a two or three day interval) because too much blood supply had been left to stop off all at once. It is, therefore, not worth too much consideration whether the flap is cut in the line of the trend of vessels or not.

As to thickness, cut what you want. The graft thickens a little through plastic infiltration after it is in place, but not much. In the end it thins again, but only under the pressure of use. One tends to make it too thick for hand plastics, but this is a small matter in case of stumps. For the bed of the graft all scar should be cut away as far as practicable, leaving a clean floor and a perpendicular edge of clean skin to which to suture the graft. Interrupted sutures, not too close, of Pagenstecher linen, or silk, should be used. As to external fixation, each case is its own rule. Save for legs, I use adhesive and pads only—for legs a plaster of Paris case to take in both limbs.

In the treatment of the surface from which the graft comes, the usual procedure is primary suturing (Fig. 3). The closure of the wound left when the flap is cut loose is a matter of local circumstances, not rules. It is apt to be easy. Secondary suture is in order—not too exact, for we are not dealing with really aseptic surfaces at this stage. At this stage, and later, I use weak alcohol dressings to preserve a reasonable asepsis, and even before this I

am apt to drip alcohol into the original dry sterile dressing after four days.

As to the time necessary to obtain a "take," I have gone on an arbitrary rule of ten days, lengthening it to twelve or fourteen rarely, if, on inspection of the sutured edges, the repair changes seem slow. Cutting loose can be done just as well under local anesthesia; sometimes the fitting in place goes better with ether. The flap is cut clear across unless one finds vessels of some size in the base; in this case I have cut these, given the flap two or three days more to get used to the change, and then finished the cutting loose. When the flap is free, trim it to suit at the edges and underneath, but not too well. One does not get sloughs at the distal edge, but it is easy to undermine, and so to get skin-sloughs (usually small) on the edge just cut loose. Catch the flap into its prepared place with interrupted sutures, first retrimming the surface of the bed it is to go into and everting the edges of this bed as needed. From this stage on it is simply a question of ordinary and rapid healing of the small interstices at the edge.

There are no precautions. The flap gets full nutrition very quickly. The only two inconveniences are the occasional excess of hair growth on the graft, and, rarely, pin-head sized trophic sloughs and ulcers which always seem to heal quickly. If, as rarely chances, there is some infection in the fat at the edge, it takes care of itself, not by suppuration, which is a vital process, but by a deliquescence of fat into a serum of sorts; a little bit of fat is lost, and the hole heals by granulation. Spreading sepsis I have not seen, perhaps because there is no lymphatic current! Sensation comes rather more quickly than one would expect and, after a few months, is in most cases normal enough to serve all purposes.

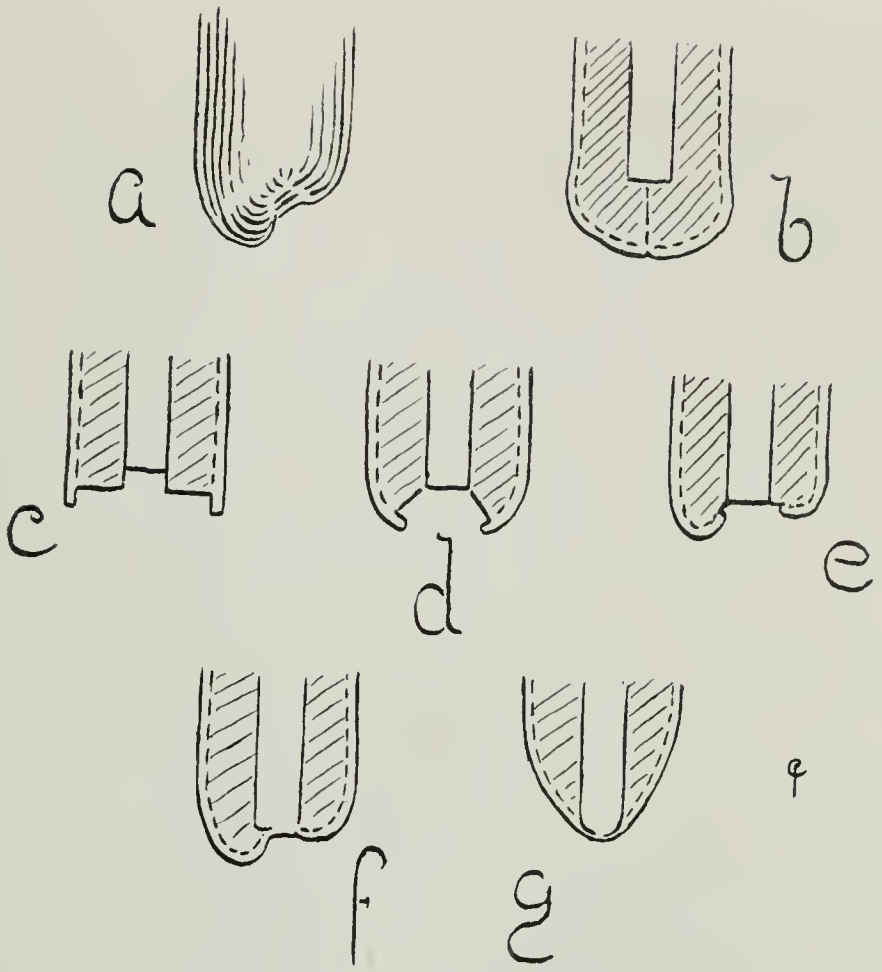

FIG. 1.—(*a*) Usual type of stump needing surgical aid; (*b*) schematic section of an ideal amputation; (*c*) war-amputation—short cuff only; (*d*) same—under traction in the cuff; (*e*) inevitable rolling in as flap heals down; (*f*) end result—like 1(*a*).

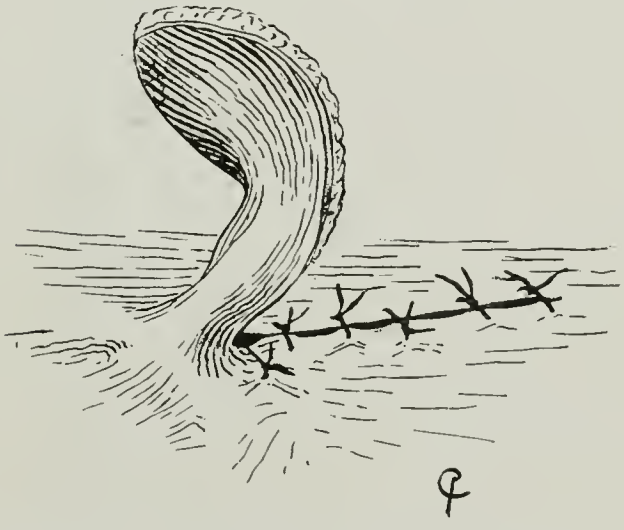

FIG. 3.—Closure of wound under graft; edge of flap graft rolled inward at its base, leaving only very small uncovered area in original wound.

(TO face page 468).

Fig. 2.—Thumb stump, short, tight, sensitive—reshaped and lengthened about ½ inch by transference of flap from abdomen. Picture taken just after flap had been given its final trimming and adjustment.

SOME UNPROTECTED ROUTES OF INFECTION[1]

By Major GEORGE A. SOPER
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THE HEALTH of the soldier is guarded in many ways, as the direct concern not only of the Medical Department but of the line. It is vitally important to the Army and to the soldier himself that he escape illness. Although many things have been done to protect him, some sources of danger still exist; some routes of infection still remain unprotected. These will continue to exist and to threaten the soldier's welfare and his life until they are pointed out and guarded. It is the purpose of these remarks to point them out; the soldier himself must place the guard upon them.

This is essentially the soldier's own matter, and it is so peculiarly his own that it seems wise to bring the subject to his attention and put it squarely before him to do everything that he can to protect himself. In a very real sense, his fate is in his own hands. These remarks are made, therefore, as though addressed directly to the soldier, the object being that they will be brought to his attention by medical officers and others.

In order that there may be no mystery about this subject, it will be said at once that the infections here considered are those of the respiratory type, and that the unprotected routes are those invisible and often unsuspected ways in which minute particles of infectious matter pass from mouth to mouth when people come together under ordinary conditions of social contact.

The dangers of infection are in direct proportion to the crowding. There are three reasons for this: (1) The greater the number of people congregated, the larger is the chance that somebody present is carrying the material which may cause others to become sick. In other words, the larger the crowd, the more the sources of disease. (2) The greater the number of people, the greater the possible routes of infection. These routes increase in geometric proportion, that is, at a rate very much greater than the number of people. (3) The closer the contact, the shorter the period of time which may elapse during the passage of the poison from person to person. This is important to remember, for the reason that the virus of disease soon loses its potency outside of the human body.

In connection with the subject of crowding, one point should be

[1] From the Division of Infectious Diseases and Laboratories, Office of the Surgeon General, United States Army.

particularly explained, since, because of its mathematical character, few persons are likely to think of it. In a barrack or other large room where a man is coughing, the danger that anyone will become infected by the infective poison which is thrown off to the air does not vary merely in simple proportion to the distance from the cougher. A person who is 10 feet away is not only twice as safe as one who is 5 feet from the cougher; he is much safer than that. Assuming that the poison spreads in all directions equally, to be twice as far is to be eight times as safe. If the virus is supposed to be given off only on a level plane, to double the distance is to multiply one's safety by 4; to treble it is to multiply by 9. These figures, it must be noted, are merely calculations; it is not pretended that they are strictly accurate. It is not to be supposed that the infectious material travels through the air in any such regular and systematic way as these figures indicate. But, like many theoretical discussions, the calculations serve to illustrate the relative seriousness of the danger of proximity to an infected person.

As has been said, the infections here considered are those of the respiratory type. By this is meant diseases of the breathing apparatus, and so-called diseases of childhood: mumps, measles, German measles, scarlet fever and whooping cough. It is believed that meningitis is transmitted in the same manner.

Speaking generally, the ways in which the resipratory diseases are spread are simple enough to understand, but very difficult to control. At bottom, the difficulty seems to be due to natural and instinctive acts which everybody performs. These acts are so common that they generally escape the notice both of those who perform them and those who are endangered thereby.

The diseases referred to here are believed to be produced always and only when something from the nose or throat of a person who is affected gets into the nose or throat of someone who is susceptible. There are many ways in which this transfer may and does occur. But the only ones which will be considered here are those which are unprovided for in the rules and regulations thus far formulated for the protection of the soldier's health. Three main routes of infection need to be discussed. How they become established, how they act, and how they should be guarded will be considered together.

POINT-BLANK INFECTION

First, infection occurs when men talk to one another at too close range. This permits infectious material to be projected directly from the lips of one into the face—sometimes actually into the mouth—of another. This is an obvious and common danger, which, strange to

say, few persons, no matter what their knowledge, take any steps to avoid. In earnest conversation men sometimes stand so close to one another that they can feel the impact of the speaker's breath.

A large measure of safety against this germ bombardment can be obtained by stepping back a distance from the too earnest person. Sometimes it is possible to step sufficiently to one side so as to get out of the direct range. Again, persons can approach closely without projecting their mouth germs at their neighbors, by speaking over the neighbor's shoulder. In this case the mouth may be brought very close to the ear. Neither earnestness nor secrecy makes it necessary for eyes and mouths to be so placed as to seriously endanger infection. To talk eye to eye and mouth to mouth is a careless habit which can and should be stopped.

MEDIUM-RANGE INFECTION

Second, infectious matter endangers health when it is distributed throughout a part of the atmosphere of a confined space as a result of sneezing, coughing and such thoughtless acts as the shaking of handkerchiefs. Some persons, who never are caught sneezing or coughing carelessly, are ostentatious in the use of the handkerchief. They never take a handkerchief from the pocket without jerking it violently in the air, as though to shake out the poisonous matters which have been carefully deposited in it on previous occasions. A used handkerchief is a dangerous thing and should never be handled without due regard to its contents. Some men have never been accustomed to using handkerchiefs; such persons should learn how to make proper use of them. In cities, and in fact, wherever people must spend much time close together, handkerchiefs are indispensable.

By most persons no attempt is made to smother a sneeze, than which there is no greater danger to others, so far as the spread of respiratory infections is concerned. In a large proportion of cases it is possible to avoid sneezing. In the remainder it is usually feasible to smother the sneeze with the handkerchief or the hand. In many instances, it is at least possible, through the forewarning of the oncoming symptoms, to move away from proximity of other persons before the explosion occurs.

Coughing is as dangerous as sneezing. It is surprising to note how few persons try to keep from coughing; and where there is a great deal of coughing this precaution is almost universally neglected. It is an interesting fact that the act of coughing is itself infectious—many people who do not cough at all when alone will do so in a crowd where others are doing it. A good deal of community coughing can be avoided altogether. A large part of it has a psychic rather than a pathologic

cause. One is led to suspect this on noting the choruses of coughs which alternate with intervals of silence, in congregations and audiences. In those cases where paroxysms of coughing are unavoidable, there is often opportunity to remove one's self from the immediate neighborhood of others while the fit is on. There is no excuse whatever for a person to cough directly at another person, or upon food, tableware, the desk, or on any objects which must be handled by others. The very least that can be done is to turn the head away.

LONG-RANGE INFECTION

Third, infectious material spreads by means of articles handled by infected persons, or coughed or sneezed upon by them, and subsequently handled by persons who are susceptable. The hand is a frequent vehicle of infection. One seldom notices it, but when attention is called to the fact, it is curious to observe how frequently the hand is put to the lips. It is common, especially with young persons, for the fingers to be continually put into the nose and mouth. The hand not only collects infectious material, an act for which its form, surface, texture and use perfectly fit it, but it is equally well adapted to part with its contagium to any moist or sticky substance with which it comes in contact.

In considering the nature of infectious material, it is common to look upon it as of larger bulk than is necessarily the case. Germs of disease are exceedingly minute; they appear visible, in fact, only as minute objects when multiplied by the microscope a thousand times. The filterable virus of colds, and of perhaps some other diseases, is composed either of particles so small that they cannot be seen or of material of a wholly liquid character.

Material expelled from the nose and throat in sneezing and coughing, although sometimes visible as small droplets of moisture, rapidly parts with its water substance by evaporation, leaving the poisonous part of the infective agent behind. It is this residue, a few minutes or seconds after it is ejected from the nose and mouth, which is most likely to remain upon the hands and other objects in the vicinity.

If it were intended to devise an instrument whereby infectious matter could be collected, transferred and implanted where it would do the most harm, it would be impossible to surpass the hand. Surgeons know this perfectly and never perform an operation without taking precautions to avoid infecting the wound. Cooks and others who handle food, whether their own or that of others, seem totally ignorant of it. It is needless to dwell upon this matter; the facts are plain. There is here an unguarded channel of infection of which everybody should be aware.

Many rules and laws have been devised in order to protect against nfection by this third method, so far as relates to common drinking cups and glasses, the exchange of spoons, forks and other articles of the mess-kit and the use of common towels. But the most important route of all has remained unguarded—the hand. Surprisingly little has been said about the dangers to which we are exposed from our hands and the hands of others. Perhaps it is because of its very intimacy that this danger is overlooked. We regard our hands unreasonably. We cough and sneeze into them and then eat from them. In shaking hands we transfer the bacterial filth which contaminates our hands to the hands of our friends. We little think that in this friendly custom we may be dealing death to those of whom we are most fond. Nor do we consider that in eating food prepared by others we may be taking into our mouths the germs which the hands of others have polluted, or that others have coughed upon. In his discovery of Typhoid Mary, the writer showed that the hand plays a leading part in the spread of intestinal disease. He is equally certain that it plays a part of no less importance in spreading respiratory diseases.

In the practical every-day affairs of life it is impossible to avoid occasional infection. The best that can be done is to avoid, as far as practicable, all unnecessary risks. We should not shake hands with people who have a cough or who are known to be infected in any way; we should not eat food which such people have handled or coughed upon; we should keep our fingers out of our mouths and noses; and, above all, we should wash our hands before eating. It is not necessary to carry the washing process to excess, but one should be careful what one handles between the washing and the meal.

A SIMPLE METHOD OF IMMOBILIZATION AND CONTROL OF PLASTIC SKIN FLAPS TO THE PENIS

By 1st Lieutenant VICTOR P. DIEDERICH
Medical Corps, United States Army

PLASTIC surgery at the present time is confronted with countless problems, but it must always solve two, before attempting the replacement or reconstruction of damaged tissues. A suitable portion of new tissue must be secured and a suitable method for maintaining it in the new position until healing has taken place must be devised.

While I was in charge of the Pus Service at Camp Pike Base Hospital, two cases with extensive infection and destruction of the skin of the penis were referred.

The first patient presented a penis above the ordinary in size. Entirely encircling it, and extending from the glans to within one inch from the base of the penis, was a cuff of necrotic skin and subcutaneous tissue. There was intense pain, and erections were frequent and difficult to control with drugs and icebags. The glans was swollen to three times its normal size. This, as well as the erections, was probably the result of the destroyed circulation. The swelling of the glans became more marked as the wound began to granulate and constrict the remaining venous circulation. For this reason, as well as others, it was very evident that the defect must be covered with a skin transplant.

The infection was treated with hot dressings until the induration had subsided; after a few days Dakin's solution dressings were continuously applied. At the end of eighteen days the necrotic tissue had been removed, the infection had cleared up and the wound was covered by healthy granulations.

The choice of skin to cover this area rested between a rectangular pedunculated flap from the scrotum or a cuff from the base of the penis and scrotum. The former method was tried first, because of the abundance of skin on the scrotum, only sparsely covered with hair.

Under local anesthesia with 5 per cent procaine and adrenalin the operative area was blocked off, care being taken not to infiltrate the tissues to be used as transplant. A rectangular flap 2 inches wide and slightly longer was then raised laterally from the median raphé, on the anterior aspect of the scrotum. The distal or free end of the flap was sutured to the dorsum of the penis along the median line, and the lateral edges of the flap were attached imme-

diately behind the glans and the skin margin respectively. This formed half of a cuff over one-half the circumference of the penis. The other half was to be covered in like manner, and the bases of the flaps were later to be severed and united along the median line on the under surface of the penis.

The method proved unsatisfactory; the uncontrollable erections caused loosening of the flap, tearing out of the sutures, and there was difficulty in keeping the wound clean.

The following procedure was next adopted and proved very satisfactory: Under local anesthesia the margin of the skin remaining on the penis was raised and the skin and subcutaneous tissue were undermined towards the pubes and scrotum sufficiently to allow the flap to be drawn out over the granulating surface of the penis and attached immediately behind the glans. In order that this operation be successful, it was necessary to prevent tension on the suture line in case erection occurred. Despite the fact that this patient was given 40 grains of sodium bromide and 5 grains of camphor monobromate every six hours and an icebag was placed over the penis continuously, erections continued to occur. The following simple contrivance solved this problem very satisfactorily:

A piece of adhesive plaster was cut to the size of a half-dollar, and a hole slightly larger than the urethral orifice was cut in the center of this. After the cuff of skin and subcutaneous tissue had been attached by its free margin to the penis, immediately behind the glans, the round piece of adhesive plaster was pasted to the glans, with the hole directly over the urethral orifice. Silkworm-gut stay sutures were then placed in the base of the cuff of skin, below the point where it was undermined. The sutures were at five equidistant points and were attached to corresponding points on the periphery of the adhesive plaster, thus forming a contrivance resembling a parachute. By this arrangement, whenever an erection occurred, stretching of the skin flap and tension on the line of the suture were prevented, as the stay-sutures brought the tension to a point below the skin flap.

The skin flap united rapidly, and the only difference in appearance from a normal circumcised penis was a slight abundance of hair on the proximal third.

The same principle was employed in a case with similar, but less extensive, destruction of tissue and the result was equally good. In the latter case the patient did not suffer from erections as severely as in the case above. Instead of using stay-sutures in the second operation, gauze was stretched from the glans to the pubes and the ends attached by means of collodium.

ANATOMICAL CHANGES IN THE RESPIRATORY TRACT INITIATED BY IRRITATING GASES[1]

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IN APRIL, 1915, the Central Powers introduced chlorine, a poisonous gas, as an offensive measure of warfare. This was rapidly followed by other chemical substances of irritating and corrosive nature. The action of all of these is dependent upon their contact with the tissues of the body, and this is effected by the vast majority in their gaseous state. Lesions of the skin, of the eyes, and of the entire respiratory tract are produced. It is natural that the liquid form which some of these substances may assume would be even more destructive, but in this state their application is limited, and lesions of the skin are much more likely to result. The latter, most important from a tactical standpoint and not to be ignored from the interest which is attached to their pathology, are, nevertheless, of secondary importance compared with the changes which are produced in the respiratory tract by these poisons in their gaseous state.

A huge number of fatalities immediately followed in the wake of this new and diabolic method of warfare, and it became imperative to study intensively the lesions produced by these substances. A whole new vista of pathology was opened concerning which only an occasional record of the action of an irritating chemical on the respiratory tract, usually a fuming acid, was at hand from accidents which had occurred in the various industries.

From the analogy of the action of irritating and corrosive sub-

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[1]A comprehensive study entitled "Collected Studies in the Pathology of War Gas Poisoning" is about to be published by the Yale University Press.

When the United States entered the world conflict the Bureau of Mines, under the direction of Director Van H. Manning, organized the investigation of toxic war gases. The medical aspects of this work were developed under Yandell Henderson, Professor of Physiology, Yale School of Medicine, and Consulting Physiologist to the Bureau of Mines. Pathology and bacteriology, with the many other phases of medical interest, grew very rapidly. A large part of the personnel for the work in pathology was ultimately obtained from the Surgeon General of the Army, through Col. F. F. Russell and Brig. Gen. W. C. Lyster. In August, 1918, when the Chemical Warfare Service was organized, the section of pathology and bacteriology, together with the other branches of the Medical Science Division, was transferred to this new organization under Col. William C. Lyster. The work was made possible only through the kindness, the sympathetic coöperation, and the financial support furnished by the various departments mentioned above, and this opportunity is taken to express appreciation.

A great part of the work was done by officers and enlisted personnel detailed by the Surgeon General, at first to the Bureau of Mines and later to the Chemical Warfare Service. Among the officers, Capt. Robert A. Lambert, Lieutenants W. P. Finney and G. B. Wislocki, and Contract Surgeon Leila Jackson should be especially mentioned, as most of the work actually was accomplished by them.

stances on the skin or the mucous membrane of the alimentary canal, this new field of investigation might have been expected to offer interest enough in itself, but that results of this study would have a broad bearing upon the etiology, portal of entry, and prophylaxis in well-known forms of respiratory infection could hardly have been anticipated.

The experiments conducted in this country include the action of a series of different gases upon a very large number of animals. This method naturally yields material which has great advantages over human tissue for similar studies, since the concentration of the gases and the time of exposure of the subject are under the control of the experimenter, and lesions can be produced at will for the investigation of acute or ultimate effects as desired.

It is unnecessary to present at length the lesions induced by exposure to all of the gases that were investigated. They have in general a similar effect, and, therefore, only a few will be more completely detailed below.

The most logical sequence will be followed if the action of chlorine is first presented, since this was the first gas that was used, since it has an intermediary effect compared with the other respiratory irritating gases, and finally, since it was the first and most completely studied. This will be followed by a description of the lesions of the respiratory tract induced by mustard gas and others which are more destructive than chlorine, and, finally, the action of phosgene and similar less virulent gases will be presented. After these three groups are considered, there will be appended a short discussion of the application of the results in the interpretation of the usual inflammatory processes of the respiratory tract.

CHLORINE

Chlorine, in the form of clouds, was used effectively only for a brief period, and later, after methods of protection against this form of attack were developed, it was extensively utilized along with other gases in shells. Many opportunities were offered to observe the symptomatology and the anatomical changes produced by this gas in man, and animal experimentation, immediately undertaken on a broad scale, was directed toward the alleviation of the agonizing acute effects. The more chronic changes, however, so far have not received adequate consideration.

The anatomical deductions recorded below were obtained in correlated studies directed toward a therapy of the effects produced

by inhalation of chlorine gas. They include observations on 326 dogs, which were exposed under controlled experimental conditions, to the vapor of chlorine. The animals died or were killed at varying intervals from a few hours to several months, and the results are classified according to the length of time of survival after exposure to the gas.

Group I.—In this group, which includes animals that died in a period up to twenty-four hours, the anatomical findings differ only in degree. In general, it may be stated that the pathological changes, both in the respiratory system and elsewhere become progressively more marked as death is delayed.

As a rule, the eyes are reddened, with often a slight mucopurulent discharge. A frothy fluid exudes from the mouth.

Grossly, there is little change outside the respiratory tract except for a dilatation of the splanchnic vessels and heart, in the latter more marked on the right side. The trachea and lungs are so filled with a frothy fluid that little space is left for air. The lungs are very voluminous, with an extreme grade of edema and congestion, and show tiny, scattered, lighter patches of emphysema. There is no inflammation of the pleural surfaces.

Microscopically, the ciliated epithelium of the trachea and bronchi is necrotic and often lifted from the underlying tissue, which shows a marked inflammatory reaction.

The smaller bronchi are occluded in two ways. First, they may be plugged by masses of necrotic tissue, and secondly, where they are not supported by cartilage, their lumina may be obliterated by spasm of the muscular walls. Often these bronchi show repeated constrictions which give the structure a corkscrew-like appearance. This bronchial narrowing is associated with alternating patches of emphysema and atelectasis of the lungs. Focal areas of necrosis are found in the atria and in the immediately adjoining alveoli and are due, doubtless, to the direct action of the chlorine gas. An acute inflammatory reaction, which begins in the lungs within a few hours, develops rapidly into a diffuse pneumonia.

Group II.—In these animals that died from two to five days after exposure, the eye changes are no longer present and there is less congestion of the abdominal organs and less edematous fluid in the respiratory tract. The trachea and bronchi show extreme congestion of their walls, which are covered by a mucopurulent exudate.

On section, one or more of the lobes of the lung may be almost entirely consolidated, or, much more often, the consolidation is patchy or lobular in distribution and involves many lobes. The areas of emphysema and atelectasis are even better defined than in the first group, especially in the animals that survive two or three days.

Microscopically, the pneumonic process overshadows the rest of the picture in the lung. It may be either lobar or lobular in type, and not infrequently it is complicated by necrotization and gangrene. The areas of focal alveolar necrosis found in earlier stages may have broken down and are transformed into abscesses, but a majority of the pus cavities develop out of the necrotizing infection of the bronchioles.

The picture of bronchiolar spasm described above is seen in its most exaggerated form in this group and is, undoubtedly, responsible for the patchy emphysema and atelectasis.

Regeneration of the bronchial epithelium constitutes an interesting feature of this stage. The superficial layer of ciliated epithelium is nearly everywhere destroyed, but an active proliferation of the deeper syncytial layer is noted, and it is from these cells that the mucous membrane is ultimately regenerated.

Group III.—In these animals that die from five to fifteen days after exposure to chlorine, pulmonary congestion and edema are absent or much less marked. The trachea and bronchi show a purulent bronchitis similar to that found in Group II.

The lungs grossly are not as voluminous as in the acute stage. Pneumonia is present in every case, but the character of the pneumonic process is somewhat changed, as is indicated in the histological report.

Microscopically, the most striking feature is the tendency toward organization of the inflammatory exudate, whether it be in the bronchi, the alveolar spaces, or in the septa.

Death in this stage is due to pneumonia and bronchitis, the organization being cut short by the death of the animal.

Group IV.—These animals survived from 15 to 193 days. Many of them were sacrificed and, except for undernourishment or emaciation, seemed in good health.

All the organs of the body show the picture generally associated with chronic infection; namely, pallor of the abdominal viscera, fatty changes in the liver and kidneys, enlargement and fibrous

tissue increase in the spleen, and a very large amount of pigment in the splenic pulp. The heart is normal.

The pleura in most cases shows no inflammatory change.

The lungs are not voluminous and there is no fluid or other exudate, except an excess of mucus, in the trachea and bronchi. The bronchioles, or what should be the smaller bronchial tubes, are often found to be thick walled, greatly dilated and plugged with exudate. These changes are associated with areas of atelectasis and emphysema of the lung.

Microscopically, the changes in the lungs are most interesting. There is a fairly marked emphysema associated with an organized exudate in the bronchioles. This process evidently causes: first, a partial, and later a complete, occlusion of the bronchiole, a bronchiolitis obliterans. The mass of organized exudate forms a sort of mould of the bronchus. It is often covered with epithelium, and it may extend well into the alveoli that communicate with the affected bronchiole.

Not infrequently the lung tissue surrounding such a bronchus is involved in an organized or organizing pneumonia with actively proliferating fibroblasts and new formed blood vessels extending from the septa into the alveolar exudate. In the more severe cases the bronchi are dilated, their lumina contain a mucopurulent mass, and their epithelial covering is thickened and made up of several layers of cells—in other words, a bronchiectasis is present.

In many places the alveoli are filled with an exudate of large, watery, vacuolated, mononuclear cells similar to the desquamated cells which are frequently found in the more chronic forms of pneumonia in man.

MUSTARD GAS

As indicated in the introduction, chlorine holds an intermediary position as compared with the other irritating gases that have been employed in modern offensive warfare.

The more vigorously caustic group has as its most typical and important representative dichlor-ethylsulphide, commonly spoken of as mustard gas, because in the crude state its odor is suggestive of mustard or garlic. This gas was used for the first time on a large scale at Ypres, July 12, 1917.

A study of the physiological effects of the material left little room for doubt that the active constituent of this new weapon was

dichlor-ethylsulphide, the preparation and toxic properties of which had been fully described by Victor Meyer in 1886.

One of the properties peculiar to mustard gas is its capacity to volatilize and recondense with variations in temperature, which is responsible for the persistence of the gas for long periods about the areas of bombardment. In both of these forms, gaseous or liquid, it is a violent corrosive for all tissue with which it may come in contact.

Another fact of moment is that its action is markedly delayed. The various lesions it produces may not appear until several hours after exposure. On account of its persistence, its value does not depend upon the attainment of a high concentration in the first few bursts of fire as is true of other gases that do not recondense. Its extensive use by the Germans is evidenced by the fact that in a period of ten days they fired about one million shells, corresponding to about 2,500 tons of the gas.

From a military standpoint, its introduction marks the most important recent development in gas warfare. Its tactical value is great on account of its tremendous effect upon the troops. An insidious, persistent, and unseen enemy, producing no effects until hours after contact, contaminating food, clothing, weapons, everything, passing through leggings or heavy gloves, and causing horrible burns upon the skin, its presence thoroughly shakes the morale morale and necessitates frequent replacement by fresh contingents.

Mustard gas is an intense local irritant. Applied to such resisting surfaces as the skin, it causes necrosis with blistering and inflammatory exudation. On the moist surfaces of the eyes and mouth it is even more active. The important skin and ocular lesions have been carefully and completely presented by Warthin and Weller in recent contributions, and the brief account below will be confined to a presentation of the anatomical lesions produced in the respiratory tract.

On account of the many important problems associated with this gas, a large amount of material was available, and the respiratory lesions in 800 animals form the basis of this anatomical analysis.

Classification of animals into groups which in the case of chlorine and similar gases seemed to be natural and sequential, cannot here be utilized to advantage. The difficulty lies in the fact that the action of mustard gas is so delayed that the animals do not die until eighteen hours after exposure, and in the vast majority there is

no acute edema as a forerunner of a more extensive exudation in the pulmonary parenchyma.

In the gas chamber the animals show no especial discomfort or excitement. In contrast to the more irritating gases, there is but slight lacrimation, nasal or salivary secretion, no coughing or choking, no bronchial or laryngeal spasm, no tremors or convulsions.

For the first few hours after exposure there is no marked change in condition. The animals are somewhat depressed, with anorexia, some vomiting and diarrhea. The eyes are red and cause some discomfort.

In from eight to twelve hours the pulse becomes slow and irregular, the respirations, irregular and labored, with difficult and stridulous expiration, frequent coughing, profuse, but not frothy, salivation, and nasal discharge. The early congestion of the conjunctiva develops into a purulent exudate and the cornea may become opaque. The animals rarely die in less than eighteen hours, but may die thereafter at intervals up to two weeks without having regained a normal condition. Most of the deaths occur during the second and third days.

If the acute effects are recovered from, the animals may live indefinitely, with or without chronic lesions.

Pathological Anatomy.—In the animals that die in the acute stage within eighteen to seventy-two hours, there are but few marked lesions externally. A redness and congestion of the conjunctivae and the skin where the hair is scant are the most frequent.

On opening the thorax, a picture is presented in striking contrast to that seen in the case of chlorine. The lungs are not so voluminous and are not filled to overflowing with frothy fluid, but they collapse only slightly. The lobes differ greatly in appearance and texture and show variation even in animals of the same group. In general, the lower lobes are the most voluminous and have a curious pale, reddish-purple color; they are very light in weight and are air-containing throughout. When handled, the fingers sink in and leave indentations. The tissues feel doughy, and there seems to be a complete loss of elasticity. The air sacs remain distended until some pressure is exerted from the outside. When sectioned, the knife cuts easily through the air-distended tissue and the cut surface is dry. There is a great engorgement of the blood vessels with thick, dark blood, which in the larger vessels has formed semi-solid postmortem clots.

Other lobes, more often the upper ones, present quite a differ-

ent picture. These are heavier, brighter red, more elastic, and on section the surface is wet with a slight amount of edematous fluid. Here light pink areas of emphysema alternate with large, rubbery, firm, darker areas of localized atelectasis.

Another condition, found most commonly in the left, middle and caudate lobes, is especially striking. Here the whole lobe is collapsed and appears as a small, dark red or almost black mass, uniform in consistency, firm and rubbery. On section the tissue cuts and feels like stale blood agar. The color is so dark as to obscure all architecture, and there does not seem to be any air in the lobe. The blood vessels are congested, but not over-dilated as in the lower lobes.

When the large bronchi and trachea are opened a yellowish-gray, false membrane is found forming a complete cast of the bronchial tree, often entirely occluding the bronchioles and causing areas of atelectasis and emphysema. The necrotic membrane peels off from the underlying tissue easily, leaving a red, sometimes hemorrhagic, surface. This condition extends as high up as the vocal cords, and there is sometimes marked edema and inflammation of the epiglottis.

Microscopically, the parenchyma of the different lobes corresponds to the gross picture. The lower lobes show practically normal air-containing alveoli with little local emphysema and atelectasis. There is an enormous engorgement of both small and large blood vessels. The terminal bronchioles are for the most part normal, but may show dilatation and epithelial necrosis. The upper lobes show alternating areas of emphysema and atelectasis as in the gross, and here, also, there is marked engorgement of the blood vessels. In the atelectatic lobes the alveolar walls are somewhat thickened and tortuous and lie close to each other. The air spaces are almost obliterated.

The larger bronchi and trachea are most interesting. The epithelium has been entirely or almost entirely destroyed and forms the basis of a membrane consisting of necrotic cells, fibrin, leucocytes, mucus, red cells and sometimes masses of bacteria. There is a polymorphonuclear infiltration of the bronchial walls.

Although there is no extensive lobular pneumonia in the gross, dogs dying as early as twenty-four hours after exposure often show areas of leucocytic infiltration associated with deposits of serum and fibrin in the alveoli. Such exudations have a tendency to zonal distribution about the bronchi, and in these areas the walls of the terminal bronchiole, as well as the surrounding alveolar walls, stain diffusely pink, indicating necrosis. There are often small areas of

hemorrhage into the lung tissue with the alveoli full of red cells.

In the dogs that live a little longer, and especially in dogs that live a few days longer, there is a more extensive bronchopneumonia, variable in extent, involving parts of one or many lobes.

Microscopically, these pneumonic areas may show central necrotization and abscess formation with profuse leucocytic exudation.

In these later cases the large bronchi and trachea have a thick, purulent exudate in addition to the membrane, or the membrane may have sloughed off, leaving a slightly roughened surface devoid of epithelium, red and bathed with pus.

In all that die acutely the pleural cavities are free of fluid. The pleural surfaces are smooth and glistening.

The heart is nearly always normal except for a slight right-sided dilatation.

The abdominal organs show at first marked congestion, later cloudy swelling, and there are frequently small hemorrhages in the adrenal cortex.

It is evident that in the very early cases, those dying within eighteen to seventy-two hours, the anatomical changes found are not always sufficient to explain death, and an added systemic effect from the drug must be supposed. In the later acute deaths the bronchopneumonia plays an important rôle.

Many animals were exposed to concentrations so low that at no time did they show characteristic symptoms, and autopsies at varying intervals did not disclose any lesions.

Other animals recovered after more or less typical acute symptoms and apparently would have lived indefinitely. When these were autopsied chronic processes were found, of which the great majority were lesions of the eyes, and only a few involved the respiratory tract.

In three such dogs, localized ulcerating areas were found in the trachea and larynx and in one case there was erosion of the cartilage with abscess formation deep in the tracheal wall. In two dogs, constriction of the trachea a few centimeters below the larynx was present, apparently produced by contracting bands of scar tissue.

Chronic changes in the lung are infrequent and are confined to minute areas of organization in isolated bronchioles, or in the alveolar tissue near the margins of the lung. In no cases was a large bronchus occluded, nor did areas of atelectasis and emphysema persist.

To recapitulate, mustard gas has a severe destructive or necrotiz-

ing effect upon the lining of the respiratory tract from the larynx to the parenchyma of the lung itself, as exemplified by those animals that die acutely after exposure to a lethal concentration of the gas. Still, chronic lesions in the finer bronchioles and in the lung tissue are relatively uncommon in animals that survive for longer periods.

The explanation of these facts appears to be that, if the gas reaches the lung in sufficient concentration to produce extensive change, the animal will die in the acute stage. The gas may be broken down in the upper air passages or it may be excluded mechanically from the alveoli by bronchiolar spasm. Certainly the absence of chronic lesions in these animals must mean that the gas never reached the pulmonary parenchyma in any considerable concentration.

ORGANIC ARSENIC COMPOUNDS

Of the organic arsenic compounds, three were investigated; namely, ethyl, methyl, and phenyl dichlorarsine.

In their action these stand about midway between chlorine and mustard. They have edema producing properties such as chlorine or phosgene, combined with the epithelium destroying properties of mustard. The edema produced is not as severe as with phosgene, and the destruction of the bronchial epithelium is not as extensive as it is with mustard gas. It does not attack the skin as severely as mustard, but does much greater damage than chlorine or phosgene.

PHOSGENE

Phosgene, first prepared by John Davy in 1812 and used up until 1915 chiefly in the manufacture of aniline dyes, was introduced as a weapon in gas warfare by the Germans in December, 1915.

Though less irritating to the nose and eyes than chlorine, and less likely to cause immediate asphyxiation, it has come to be regarded as one of the most dangerous and effective of the poisonous gases, producing a large number of casualties with a high percentage of fatalities.

Phosgene probably owes its toxicity to the property of being readily split up, in the presence of water, into HCl and Cl. When inspired, little decomposition takes place until the gas reaches the lungs, where in the smaller bronchi and alveoli it comes into contact with sufficient water vapor to bring about the evolution of HCl. This would explain the severe damage found in the bronchioles and the alveoli and would account for the slower and more gradual development of the signs of pulmonary injury than is the case with

chlorine or bromocyanogen, which do not require for their action any preliminary decomposition.

So far as has been determined, the effects of the gas on animals differ in no essential way from those seen in man. The brief review to follow will deal only with the experimental lesions produced by the gas in dogs.

As might be expected, the changes found at autopsy after exposure to phosgene, vary greatly with the length of time the animal has survived. On this basis, the animals have been divided into three groups, the acute, the subacute, and the chronic.

Group I included 260 dogs that died or were killed within forty-eight hours.—The gross anatomical changes in this early period are very striking. Frothy fluid, sometimes clear, sometimes blood tinged, oozes from the mouth. The eyes may be a little reddened.

Acute congestion of the viscera, with engorgement of the great vessels and enlargement of the liver and spleen, constitute the only positive findings in the abdomen.

As the sternum is removed, the great volume and non-collapsibility of the lungs are at once evident. The anterior margins nearly meet in the median line and tend to overlie the heart. The pleural spaces are obliterated. The loose tissue of the anterior mediastinum is somewhat edematous, but an excess of fluid in either the pleural or pericardial cavities is unusual.

The heart shows a dilatation, more marked on the right side. The cavities and valves present nothing abnormal, except for the presence of flame-like hemorrhages beneath the endocardium, which are not infrequent.

Respiratory Tract.—The larynx may be slightly edematous, but is otherwise normal. The trachea is more or less filled with frothy fluid, and in the bronchi there is more fluid than froth. This fluid is clear, faint yellow and looks like serum. In the smaller bronchi it may be slightly viscid, owing to an admixture of mucus and fibrin.

The mucosa of the trachea and of the larger bronchi is smooth, with some congestion toward the smaller bronchi. The lungs are very voluminous and heavy. The pleura is smooth, glistening and moist, and its lymphatics are often conspicuously dilated. An acute pleurisy at this early period has not been seen.

The color of the lungs is most striking. They are extraordinarily mottled, large, whitish patches alternating with deep red ones. The light-colored patches are elevated, crepitant areas of acute emphysema. The darker spots appear by contrast to be collapsed,

though this is only partial. The dark color is due also to an extreme congestion.

In animals dying in the first twelve hours, this edematous condition is not so marked, while in those passing the twenty-four-hour period it may become the most prominent feature, quite overshadowing the congestion and emphysema.

On cutting the lung, fluid oozes from the surface and a great quantity can be expressed. It is straw-colored from the pale translucent areas, or red from the dark-red areas.

Close inspection of the cut surface of the lung may reveal a number of tiny, grayish foci scattered everywhere. These are patches of early broncho-pneumonia which are often overlooked on account of the presence of the massive edema and congestion.

Microscopically, the large bronchi, like the trachea, show little change, but as soon as that portion of the bronchiolar tree which is not protected by cartilaginous rings is reached, contractions of the muscular walls are observed, causing irregular, corkscrew-like distortions which may extend down into the finer bronchioles. These are not usually prominent near the atria, as the smallest tubes are frequently greatly dilated and appear as large sausage-shaped sacs which communicate freely with groups of dilated alveoli. In other instances, the bronchioles may be obstructed with dense plugs of inflammatory exudate and necrotic cells.

While it is difficult to determine the exact relationship of these changes in the bronchial tree to those in the lung itself, there can be little doubt that the patches of emphysema which are such a prominent feature of every case are the result of the bronchial changes.

As early as two hours after exposure, there is histological evidence of necrosis of the epithelium of the finer bronchi. This is in contrast to the epithelium of the larger bronchi and trachea which is well preserved, even the ciliated border remaining intact. In many cases the bronchus forms the center of an inflammatory focus which extends for a variable distance into the surrounding lung tissue.

Besides these focal lesions there is evidence of a more general inflammatory reaction in the lungs. Nearly everywhere there is an increase in the number of polynuclear leucocytes in the alveolar walls, and occasionally these are seen in process of migration. The alveoli nearly everywhere contain more or less of the edematous fluid with some fibrin. With special stains a thick layer of fibrin

can be demonstrated lining the alveolar wall. Frequent strands cross the capillary to a similar fibrin layer on the wall of an adjacent alveolus. The presence of fibrin in this situation not only interferes with the gaseous exchange but also constitutes a serious obstacle to the flow of blood through the lungs and forms an anatomical basis for the dilatation of the right side of the heart.

The extent of this pneumonic process varies in different animals.

Group II; these animals died three or more days after exposure to phosgene.

The anatomical changes are characterized by the presence of a severe and widespread inflammatory process in the respiratory tract. Externally the body presents nothing abnormal.

There is some splanchnic engorgement, and the pleural cavities are not so well filled as in the acute stages, though the lungs are still voluminous.

The heart is dilated, principally on the right side.

The upper respiratory tract, including the larynx and trachea, is practically normal in appearance, but the smaller bronchi from above downward become progressively more inflamed and dilated. Many are plugged with an exudate which is sometimes opaque and yellowish; in other instances, translucent and mucopurulent in character. The dilated bronchi can be traced sometimes to the pleura, where they end in rather wide sacs just beneath the surface.

The lungs are very voluminous. Pale-red areas of consolidation, often irregularly wedge-shaped, stand out in sharp contrast to the remaining portion of the lung, which is cushiony and crepitant. In animals that survive only three days these solid areas are not as prominent a feature as in the ones that live longer.

The lobes vary in weight. All are heavy, but the pneumonic lobes outweigh those which are the seat of edema and congestion only.

In the more acute deaths the lungs on section are still very moist. Later, the areas of consolidation stand out as dry granular patches that vary in size from a few millimeters to many centimeters. In the smaller areas of consolidation there is almost always a central bronchiole which is prominent on account of its thickened wall and a purulent exudate in its lumen.

Histologically, the trachea shows no change. As one passes down into the bronchi where they are surrounded by lung tissue, the epithelium is in part desquamated and is mixed with an exudate in varying proportions of red and white blood cells and mucus.

In all instances the bronchioles exhibit very striking changes. They are dilated and appear as large, round holes filled with exudate. The epithelium is sometimes still distinguishable, but is usually desquamated and mixed with an exudate of red cells and polynuclear leucocytes. In many instances the alveoli, two or three rows deep about the bronchiole, have lost their architecture, and their walls are obscured by the leucocytic infiltration. At the periphery of such a broken-down area, which is essentially a miliary abscess, there is a zone of hemorrhagic pneumonia.

The pneumonic zones fade rather abruptly into areas where the lung tissue is well preserved. The alveoli here may be partially collapsed or emphysematous. Their walls are always prominent on account of the dilatation of the vessels. The alveoli contain some fibrin and serum with occasional desquamated cells and leucocytes. The pneumonia is often widespread, but the character of the reaction is still that of a lobular pneumonia, and it is clear that the infection is bronchial in origin. Organization of the exudate is seen now and then, but is a much more common finding in dogs that have survived longer. Otherwise those animals that show acute symptoms and that die within a few weeks from the effect of the gas upon the respiratory tract show no important variations of the picture just detailed. Microscopically, there is always a widespread organizing bronchitis and bronchiolitis.

Group III—Animals that were killed when seemingly in good health from three to one hundred and twenty-nine days after exposure to phosgene, and that never exhibited marked acute respiratory effect, are included in this group.

The gross changes are not very striking. Except for the lungs, there is little worthy of note. The trachea and larger bronchi are quite normal.

The lungs are moderately collapsed, but the collapse is not uniform. There are dark pink atelectatic patches here and there; the rest of the lung is more or less emphysematous. Tiny, firm nodules may be felt or seen on section, but these often are not conspicuous. Hemorrhages in the nodules and elsewhere in the lung, as well as "ring hemorrhage" about the vessels, are frequent. The bronchi are more prominent than normal. Their walls look thickened, and in the lumina there is an excess of mucus.

Microscopically, the emphysema and atelectasis are more pronounced than in the gross. The alveoli may show no other change. There is a distinct fibrous thickening of the walls of some of the

medium-sized bronchi and an infiltration by mononuclear wandering cells most marked in the outer coat. This lesion may be termed a peribronchitis. In a much larger number, the lumina of the bronchioles are occluded by a mass of granulation tissue, and the organization process may extend for a variable distance within the surrounding alveoli. The lesions are a perfect example of obliterative bronchiolitis.

These changes in the bronchioles are quite sufficient to account for the persistence of the atelectasis and emphysema, which seems to be directly proportional to the extent of the bronchiolar involvement. The susceptibility of these chronic gassed dogs to pneumonia is also probably referable to the presence of foci of infection in the bronchial walls.

SUPERPALITE

A number of gases related to phosgene were found in German shells during the latter part of 1916 and 1917.

Of these the most important is trichloromethyl chloroformate or superpalite, also known as diphosgene because its chemical analysis shows a double molecule of phosgene.

Its action upon experimental animals is very similar to that of phosgene.

CHLOROPICRIN

Chloropicrin belongs to both the lacrimatory and respiratory irritant group of war gases. Even in relatively low concentrations it induces an active flow of tears. Exposure to high concentrations causes severe damage to the respiratory tract followed by extreme edema of the lungs, similar to that produced by chlorine and phosgene.

Chloropicrin also causes nausea and vomiting, and it is chiefly this action that has led to its wide use in modern warfare and given it the popular name of "vomiting gas." Being a very stable and non-absorbable substance, it penetrates the gas masks more readily than many other noxious gases and, by its nauseating effects, forces the soldier to tear off this defense and expose himself to other more toxic gases such as phosgene, with which it is very frequently combined.

A study of the pathologic effects of chloropicrin shows that in its action on the respiratory tract it occupies a position somewhere between chlorine and phosgene. It damages the trachea and larger bronchi less than chlorine but more than phosgene. In its action on

the bronchioles and alveoli it resembles phosgene very closely, but focal areas of alveolar and bronchiolar organization associated with alternating patches of atelectasis and emphysema, though found at autopsy, are not such a striking feature as they are with phosgene and diphosgene.

On the other hand, pleurisy, fibrinous or purulent, much more frequently complicates chloropicrin inhalation than any of the other gases.

CYANOGEN CHLORIDE AND BROMIDE

The very acute death during exposure to these compounds is effected by the cyanogen portion of the compound.

Cyanogen chloride may produce pulmonary edema and congestion and a very mild inflammatory process in the bronchioles, which may persist for some months, but does not produce lesions of importance.

Cyanogen bromide, on the other hand, produces a severe inflammatory reaction analogous to that after chlorine.

This irritative action must be attributed to the halogen radical, since hydrocyanic acid itself has no direct effect on the respiratory tract.

DISCUSSION

In comparing the action of the three most important gases, mustard, chlorine, and phosgene, it may be recalled that they all seriously affect the respiratory tract, but that they differ in the localization and in the severity of the lesions that they produce.

Mustard in lethal concentrations not only destroys the lining of the entire bronchial tree, but its necrotizing action involves the lung itself. In a more dilute form it produces necrosis of the epithelium of the trachea, which, however, becomes less marked toward the finer ramifications of the bronchi, and the gas seemingly spends itself in the upper air passages. It either does not reach the bronchioles and alveoli, or it reaches them in such a diluted or changed state that the chronic pulmonary lesions after this gas are rare.

After chlorine inhalation, there is also an injury to the lining of the entire respiratory tract, even to the ducti alveolares and the alveolar walls themselves. The epithelium is blistered, but the necrosis in the trachea and in the larger bronchi is not as deep and extensive as it is with mustard gas. Probably on account of its

less efficient corrosive action, the injury of the pulmonary parenchyma itself, not so severe even in the acutely fatal cases, results more frequently in chronic lesions, which may cause death long after the early symptoms have passed.

Phosgene has the least severe action upon the upper respiratory tract, but in its wake the most frequent and persistent lesions are left. Organization of bronchiolar and peribronchiolar exudates with obliteration of the lumina or bronchiolectasis, as the case may be, leads naturally to serious and progressive mechanical difficulties, not only with the ingress and egress of air into the alveoli, but also with the circulation, and, perhaps, with the aeration of the blood in the lungs.

That there is immediate death of the epithelial lining cells of the respiratory tract after exposure to these poisonous gases may be demonstrated with vital stains. It has long been known that the nuclei of living cells remain unstained, even though a large amount of a very readily diffusible dye may be present in the circulating fluid which bathes them. Once a cell is dead, however, its nucleus, as if by magic, sucks up the coloring matter. Trypan-blue is, unquestionably, one of the most efficient of these reagents and, for this reason, dogs whose circulation had been previously heavily laden with trypan-blue were exposed to both chlorine and phosgene. Within two hours after inhalation of chlorine, the nuclei of the mucous membrane of the trachea, bronchi, bronchioles, and even the epithelial cells and the cells of the alveolar walls themselves, may be deeply stained. After phosgene, however, only the lining cells of the bronchi and bronchioles are thus affected.

This injury is the anatomical expression of the destruction of the normal protective mechanism of the upper respiratory tract and is followed by an invasion into the lung of the bacterial flora of the mouth. This has been demonstrated repeatedly by mouth cultures before exposure to poisonous gas and subsequent culture, not only of trachea and bronchi, but of the lung itself.

A strikingly similar series of events takes place in the respiratory tract in influenza. Here the pneumonic process, preceded by or simultaneous with a tracheo-bronchitis, is associated with the presence of the bacterial flora of the mouth. Here again the same cause and effect may be observed. As in the gassed animals, so in this respiratory disease, death may occur with diffuse pneumonia, lobar or lobular in type, and more rarely with peribronchial con-

solidation. On the other hand, death may not result where the lesion has been less severe, confined perhaps to the bronchial tree itself. Intermediary forms, where a fatal outcome is more or less delayed, are associated with necrotization of the bronchial and alveolar walls, as well as of the exudate within their lumina.

In the more chronic types of this latter lesion, obliterating bronchiolitis, diffuse and saccular bronchiectases, and organized pneumonias may result in progressive mechanical interference with the aeration and circulation of the blood in the pulmonary system.

THE MECHANISM OF RESPIRATORY DISEASE

Anatomical studies of the effects of poisonous gases upon the respiratory tract, comparable in every way to those of influenza, lead to the conclusion that the portal of entry of bacteria into the lung is through the upper air passages, and that the bronchi or bronchioles are the normal protective mechanism of the respiratory tract.

There is conclusive experimental evidence, as well as the suggestive selective action of phosgene, to indicate that the bronchioles are more important watch-dogs for the alveoli than are the larger air passages, but, with an extensive exudate in the larynx and trachea, a great deal more material will find its way into the bronchioles than these structures can normally care for.

In both of these conditions, gas poisoning and influenza, extensive edema and congestion of the lung are regularly encountered. The edema especially may present a vehicle for the dissemination of the infecting organism throughout the lung after these pass the bronchiolar barrier.

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WOUND SHOCK[1]

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A DISCUSSION of shock in connection with army duties under the present circumstances seems a somewhat warmed-over affair. Fortunately, however, what we have learned about shock during the last few years in connection with war is going to be of service in civil life, for shock is a phenomenon which is seen not only in war time but in times of peace. Its common occurrence in times of war is well recognized. If you will look up the literature of shock, you will find that there has always been a great increase in articles written about it after wars. The phenomena of shock accompany serious injuries. You see shock in civil life after severe injuries in machinery, in railroad accidents, etc.; and you see it in war time, particularly in the sort of warfare which has been engaged in during the last four years, after wounds due to large shell fragments—not so frequently after bullet wounds. It has been no uncommon thing to see a man brought into a casualty clearing station or an advance dressing station suffering from a huge shell wound, perhaps of the thigh, and he will exhibit not only this local injury but a general bodily state as well—the state of shock. He is cold; he is sweating; he is rather listless, occasionally restless; you watch his respiration, it is rather superficial; his pulse rate is up; if you take his blood pressure, you find it low; he is pale. These are the characteristic features that you see in shock. The low blood pressure is probably the most characteristic feature of this group of phenomena which we call shock.

A good many explanations have been offered to account for the low blood pressure. There is the theory which was brought forward by Mitchell, Keen, and Morehouse at the time of the American Civil War. They assumed that the low pressure was due to an exhaustion of the vaso-motor center with relaxation of the arterioles. That is a theory which has been more recently supported by Crile and has had an amplification in his hands so that he assumes that the shocked man is suffering from general exhaustion, not only of the central nervous system but of various other parts of the body. The theory is one which may account, it seems to me, for certain cases,

[1] A lecture to the officers of the Army Sanitary School at Langres, France, November 29, 1918, based upon studies at the Laboratory of Surgical Research, A. E. F., Dijon.

though I have difficulty in believing that such exhaustion is the main and primary factor in most of the cases of shock which I have seen. The evidence for the theory is based, as you probably know, chiefly on observations made on nerve cells taken from shocked animals and shocked men. These nerve cells have been subjected for a considerable period to low blood pressure. We know that nerve cells are extremely sensitive to lack of blood supply. We need have only temporary retardation of the flow of blood to the brain and we faint away. The low blood pressure of hemorrhage and shock would account for the change in nerve cells taken from the body after the death of the shocked man or shocked animal.

Another theory, which has had considerable support recently, ascribes the state of shock to a liberation of fat, particularly in cases in which long bones are struck and broken. The fat on liberation enters the blood stream and passes to the lungs where, as emboli, it plugs the vessels. Thus, it is assumed, it causes diminished blood flow from the right to the left heart, resulting in a fall of arterial pressure with consequent interference with the circulation. This theory, also, it seems to me, has relatively little support so far as it is concerned with the causation of shock. We must admit that fat is liberated in this way, but that is very different from admitting that it is present in sufficient amount to do damage. In the first place, the vessels which carry blood from the right to the left heart are of ample capacity; half the lung area may be removed without interfering with the circulation. Furthermore, when fat emboli occur to a degree which results in interference with the circulation, there are always disturbances of respiration. Some of you may have seen these striking phenomena in human cases—the apnea or hyperpnea. Now such disturbances of respiration are not seen typically in cases of shock.

Again, if the fat were gathered in the lungs to a degree which would check the circulation, there would be backing up of blood in the right heart, and that would manifest itself in the veins, which would stand out prominently because of the gathering of blood in them. But if you try to introduce a needle into the veins of a shocked man, you will usually find that the veins, instead of being easy to get into, are rather difficult, because they are so collapsed. The blood is not accumulated in the veins as you would expect according to the fat embolism theory. Furthermore, the therapy which has been used in the past few years to treat shock—that is, the transfusion of blood—would be just the wrong thing to

do if the blood were being checked in its flow through the lungs. You can readily see that, if the flow were checked, the right heart would be already in difficulty because of the obstruction. Increasing the blood flow by intravenous injection should, if the veins were full already, produce instant greater difficulties. The results of that therapy, which are in the main satisfactory, have not indicated an embarrassment of the right heart by transfusion.

Another theory which has had a good deal of attention paid to it is that supported by Henderson. He assumes that when a man is badly wounded he begins to breathe rapidly and deeply because of the pain. This induces a loss of CO_2 from the blood, he declares, this loss causes the blood pressure to fall, and the man goes into shock. I shall not discuss the experimental evidence which Henderson has for that theory; all I need say is that we have watched shocked men from the time of their being wounded, back through all the stages of their journey to a hospital where they were left, and at no stage except a very late one have we found them breathing in the manner Henderson assumes. Not infrequently men who had suffered severe wounds did not complain of pain at all; they testified to having been hard hit, but they did not say that they suffered pain. I remember a man who one night was coming down a road which was being shelled, and who felt something hit his hand; it seemed to stick there, and when he attempted to shake it off found he was shaking off his own hand which was hanging by a shred of skin. There was no feeling of pain whatever. On the contrary, I have seen a man who had been hit after a bombing raid and who was suffering extreme pain in his wrist from a little bomb splinter; but he was breathing about twelve times a minute with a grunting respiration, not at all as Henderson assumes. This theory seems to me, therefore, not to account for the fall of pressure which occurs.

Now in order to bring out some evidence which I wish to present to you, I will first lay a theoretical basis for it. In some old observations made years ago without reference at all to shock, it was noted that the first products of protein digestion, the proteoses and the peptones, are extremely toxic. If you inject these products into an animal, they will produce what is called "peptone shock." In the second place, it has long been known that these substances, when introduced into the blood stream, will cause profound effects on the blood vessels. You will recall that there is a "peptone class" of lymphagogues which cause such a change in the capillary wall

that fluid, the lymph, passes out from the blood in increased amount. We also know one or two other things in this connection. One is that if tissue is injured it will undergo auto-digestion, that is, if cells are broken, a digestive process begins in them with a production of substances similar to those produced in normal digestion. So you can readily understand that if tissues are injured there would be the possibility of toxic substances being produced by local action in the injured tissues, and that these substances given off in the blood stream might cause the changes which I have described, a fall of blood pressure and a greater permeability of the capillary walls, with alterations of the relationship between the blood and the fluids outside the blood vessels. These changes would be quite disturbing to the entire bodily organization.

I have evidence here, in some records that I should like to show you, that bears on these possibilities. Here is a blood pressure record from an animal in which the muscles were injured in one hind leg, and you observe that shortly after the injury, in about 20 minutes, the blood pressure began to go down; it went down to shock level in about an hour, where it remained, with no tendency to rise at all. The fall of pressure is not due to extravasation of fluid from the blood vessels into the injured tissues. We have proved that fact by producing an injury on one side only; and after the fall of pressure had occurred and the animal was killed, we have removed the legs by symmetrical cuts on the two sides. On weighing them we have found that the difference in weight did not account for a sufficient loss of blood into the injured tissues to give any satisfactory explanation for the fall.

Now observe what occurs if the blood vessels of the leg are first tied and the leg muscles then injured. In this record clips were left on the blood vessels for thirty-five minutes after the muscle injury. There was no passage of blood into or out of the injured region during that period, and you note that there was no fall of pressure. As soon as the clips were released, however, the pressure promptly dropped down to a shock level.

In this record the nerves of the leg were cut to begin with—all the nerve connection between the central nervous system and the injured region was severed, and the leg was then injured. You see that the blood pressure slowly fell, though there was no stimulation of nerves which could possibly affect the nervous system. At a later stage in this case the blood vessels of the region were tied

so there was no blood connection between the injured area and the rest of the body. You observe that under these circumstances the original blood pressure was slowly regained.

These observations, it seems to me, give a rational account of the way in which shock is brought about. It appears to be brought about chiefly by the absorption of toxic materials from injured tissue into the blood stream which carries them about so that they affect all parts of the body. Shock, then, is a general bodily state following a local injury, a toxemia arising from the local injury, and quite distinguishable from it. This secondary relationship of shock to injury is something which has been observed repeatedly in the course of the war. Stretcher-bearers, regimental medical officers and others have noted again and again that a wounded man will leave the front line in fairly good condition, and only when he gets to the ambulance dressing station, or even farther back, will he be in a state of shock.

I have another record, which illustrates the effect of agitating the ends of the broken femur in the injured tissue. After the muscles had been damaged and the pressure had gone down slightly, the muscles were further injured by agitating the broken bone. The pressure dropped down sharply, and by agitating the bone again the pressure dropped down sharply again, and so on.

A number of the practical matters arise in connection with the observations which I have developed before you. In the first place, advantage is attained from shutting off from the rest of the body a limb which is so badly injured that there is no possibility of saving it—a leg that is so badly mangled, for instance, that there is no possibility of its restoration to usefulness. A tourniquet should be put tightly around the leg, as near the injury as possible, and kept there to prevent the absorption of toxic material which might result in shock. Since these observations were first reported I have had brought to my attention a number of instances of men who had had tourniquets thus applied to stop hemorrhage and who had not gone into shock, although their injuries were very "shocking." Under these circumstances the surgeon should remove the mangled limb before removing the tourniquet.

There is another practical matter which is concerned with the use of the tourniquet. Medical officers who have come over here from the United States have been told that the tourniquet may be applied but must be released every twenty minutes to let the blood stream

into the part and to keep the circulation going. Well, under war conditions, particularly such conditions as we have had during the past two or three months, that advice is impossible to carry out. A wounded man has a tourniquet placed on his arm or leg; he is covered up with blankets and put in an ambulance. He may be there twenty-four or thirty-six hours with very little attention paid to him. During that time the blood stream is shut off from the injured part of the limb. You can readily understand that the same processes are going on in that limb that are going on in injured tissue; the tissues are dying and becoming subject to autolysis. Now when the man finally arrives at a hospital the surgeon is likely to say: "Well, this is a minor wound; we can save that arm," and he removes the tourniquet. I have heard of six men who died from shock under precisely such conditions. One man arrived in good condition with a slight wound in the wrist and with a tourniquet on his arm above the elbow. The surgeon thought the wound so slight that there was no reason at all for not cleaning it up and saving the arm. The tourniquet, which had been on for an indefinite time, was taken off, and in about two hours the man fell into profound shock from which he could not be recovered. Dr. Quénu, of the French Service, has met similar instances in his experience in the French Army. So there are serious dangers which attend the use of the tourniquet if it is left on a long time and then removed.

Another practical point which comes out of these considerations is that if a broken bone is moving about in the injured tissue, it is going to injure the tissue still further in the manner which I have illustrated experimentally. The testimony of surgeons who have had experience throughout the war—who saw wounded men brought back in the early days without splints, and who saw them brought back later properly splinted—has been that the Thomas splint probably had done more to reduce shock than any other agency. According to the evidence I have presented, it has reduced shock chiefly by lessening the amount of tissue damage arising from the movement of the ends of broken bones in the torn tissues.

At present I shall not go into the theoretical considerations of how this toxic material lowers the blood pressure. It is, however, of some interest to observe that shock is a common accompaniment of gas gangrene resulting from varieties of gas bacilli and it is interesting in this connection also to observe that all of these bacilli are proteolytic in their action. They cause the breaking up of the

protein molecule and therefore may bring about shock in the same way that tissue injury may bring it about; in one case there is trauma and autolysis, and in the other bacterial action breaking down protein and liberating toxic material.

There is a secondary factor that enters into the shock complex that is of great importance. That is the low blood pressure itself. You all understand that when the blood pressure falls the head of pressure in the arteries, which keeps the circulation going, is incapable of continuing the blood flow at the former rate, precisely because the pressure has fallen. If you fill a tank full of water and let the water run out through a hole at the side near the bottom, the water will squirt for some distance when the tank is full; but the force of the stream becomes less and less as the tank empties and the head of pressure is gradually lost. So in our circulation. The high head of pressure, about 120 mm. of mercury normally, keeps the blood flowing at a rapid rate. If the head of pressure falls, the blood stream runs slower and slower. This implies that the trips which the blood corpuscles make between the lungs and the tissues in a given time become fewer and fewer, and, in turn, that the amount of oxygen carried in the tissues is reduced; and finally, as that process goes on, there comes a critical point at which the oxygen supply is insufficient. When that occurs there is a failure to burn some of the acid products of activity in the body. They are given off into the blood stream and drive away CO_2. If examinations are made, it is found that there is a critical level at which the CO_2 content of the blood plasma becomes reduced. It is possible to lower arterial pressure artificially. We introduced a cannula through the chest wall into the pericardium, closed the chest tightly so the animal breathed normally, and then increased the pressure about the heart inside the pericardium. Thus we could reduce the blood flow from the heart and control arterial pressure. The original pressure was 140 mm. of mercury. It was first reduced to 60 mm., and at the end of an hour there was a very marked reduction of CO_2 content of the blood plasma, a reduction which can be accounted for by the liberation of non-volatile acid into the blood stream and by the driving off of CO_2 by this acid. When the pressure was lowered to 70 there was a slight fall in the CO_2 content of the plasma. These observations indicate that there is a critical level in arterial pressure a little below 80 mm. of mercury, at which the supply of oxygen becomes insufficient.

These experimental results on lower animals are confirmed by a series of observations which I made in the summer of 1917 in a casualty clearing station at Béthune in the British service. In a series of 43 cases of shock, it was found that when the systolic blood pressure was above 80 mm. of mercury, the CO_2 capacity of the plasma was approximately 50 volumes per cent, that is, on the boundary line between normality and acidosis. When the blood pressure fell below 80, there was a sharp drop down—between 70 and 80 mm., 43 volumes per cent; between 60 and 70, 36; between 50 and 60, 24. This drop in the CO_2 content of the plasma indicates acidosis, *i. e.,* the development of non-volatile acid in the blood. In so far as it is merely a change in the blood I do not regard it as particularly important unless it is carried to such a degree that the man begins to have respiratory difficulties, an "air hunger." I have seen a man in shock breathing forty-eight times a minute, just as if he had been running hard. That is an extreme acidosis, but in most cases of shock you do not find acidosis developed to that degree.

The importance of the acidosis lies in its inner significance—its significance as an indication that insufficient oxygen is being carried to the tissues by the slow circulaton. We are all famliar with the fact that tissues differ in their needs for oxygen. Some muscle tissue—that of the intestinal tract, for example—can get along without oxygen for three hours or so; on the other hand, if the blood supply to certain cells of the cerebral cortex is shut off for six or seven minutes, they will be so badly damaged that they cannot be revived. What happens, then, as I conceive the processes of shock, is first that there is a fall of blood pressure due to tissue injury. It falls to a greater or less degree. If that degree is above the critical level, the pressure may—as I can show you—undergo a spontaneous recovery. Here, for example, is an experimental case in which the pressure fell to 95 mm. of mercury, remained there for a short time, and then underwent a gradual restoration to normal. In other words, there was not enough injury done in that case to produce profound shock, with failure of the pressure to rise again. But if the pressure falls below the critical level and the blood stream is very much slowed, then there is further damage, which arises in consequence of insufficient oxygen supply. This damage can actually be demonstrated.

Here is a record that brings out this point. The arterial pressure was lowered by increased intrapericardial pressure from 140

to 60 mm. of mercury, and held there for an hour. You understand that there was no hemorrhage or loss of blood at all, merely a low pressure continued for an hour. At the end of that time the pressure was allowed to rise as high as it would. It rose to 105. Then it was again lowered for an hour, and again allowed to rise. It rose to 90. It was once more lowered to 60, and when the check was taken off it did not rise at all. That effect we have obtained again and again. If a low pressure exists, therefore—a pressure below the critical level—and it is allowed to persist, a progressive damage results due to the deficient oxygen supply to the sensitive nerve centers which have control over vascular tone. And the lower the pressure falls below the critical level the faster is the damage done, and the longer pressure is allowed to persist below the critical level the greater is the damage done.

You will observe at once that there are practical aspects of these observations. If a man has a blood pressure below the critical level, and if in spite of various measures that are taken, such as rest and the application of warmth, the pressure fails to rise above this level, it must be raised. That can be done in two different ways. The best way to do it is by the transfusion of blood. Transfusion of blood increases the volume of circulating fluid so that the pressure rises; in consequence of the higher head of pressure the rate of flow is restored to normal and oxygen is delivered to the tissues as they need it. But blood not only increases the volume of circulatory fluid, it also increases the number of carriers of oxygen in the stream. If shock is complicated by bleeding, there is obvious advantage in using blood.

There is another way, however, in which greater use can be made of the carriers which are present, and that is through the introduction into the blood vessels of an indifferent fluid which by increasing the circulatory volume causes a rise of pressure. This rise of pressure results in a faster flow, in an increase in the number of trips which the red corpuscles make between the lungs and tissues, and consequently in an increased delivery of oxygen. There are various fluids which have been suggested. Normal salt solution has been very commonly used in the past, but the difficulty with it is that it causes a very temporary rise, within fifteen or twenty minutes—half an hour at the outside—the pressure is down where it was before. Another fluid which has been used is a glucose solution. However, that also fails to keep the pressure up for any considerable length of time. Professor Bayliss, of London, has

advocated a solution of 6 per cent gum acacia in 0.9 per cent sodium chloride, the so-called "gum-salt solution." This has been used largely both in the British and American services as a means of raising the blood pressure, its value lying in the fact that because of its colloidal character it does not escape from the blood vessels, as does simple salt solution, and therefore causes a permanent rise of pressure. Like blood, it has relatively little value if given late in shock. Here is a record of an injection of gum-salt solution given too late. The injection was made when the respiratory center was already showing signs of distress, and therefore the vasomotor center was also probably in trouble; in forty minutes the pressure was down at the low level where it was before. On the other hand, if the solution is given early in shock, the pressure will be raised and will persist at the high level.

Either blood or the gum-salt solution should be given early, for the reasons I have already developed. If transfusion or infusion is done after the damage to the medullary centers—the vasomotor center, especially—has occurred, no advantage arises from it. If, in an experimental animal, the medullary centers are destroyed altogether, and if blood, or salt solution, or any other compensatory fluid is introduced into the blood stream, no permanent rise of pressure results. It is like pouring fluid into a sieve. The pressure may rise temporarily while the fluid is going in and may remain high for a little while, but if the medulla has been destroyed the pressure simply falls again to the original level. Precisely the same phenomenon is seen in human cases if a low pressure is allowed to persist for a long time. Obviously, therefore, resuscitation measures in warfare should be carried as far forward as possible, so that they may be applied early.

There are other measures than transfusion or injection which can be employed to increase the blood volume. The simplest of these is fluid given by mouth or rectum. Water or salt solution taken into the body through the alimentary tract may remain as a permanent addition to the circulating blood. In clinical studies which Major Robertson has made that fact has been exactly determined; in the course of twenty-four hours he has succeeded by this simple means in increasing the circulating fluid by 1,500 c.c. That is approximately 33 per cent of the blood volume of a large man.

Other simple measures can be employed in treating shock. One of these, and a most important one, may be associated with a differ-

ence in the distribution of blood in the body which we observed at Béthune in 1917. We found a remarkable discrepancy between the blood counts in capillaries and veins. Here is a record showing this discrepancy. The top of the record represents the capillary count, the lower part of the record the venous count, in cases of severe shock, moderate shock and no shock at all. You observe a very striking difference between the two counts in cases of severe shock. In this case, for example, there are 5,000,000 corpuscles in the venous count, 8,000,000 in the capillary . Not uncommonly there may be differences of 2,500,000 corpuscles between the venous count from the elbow vein and capillary counts taken at the same time from ears, toes, and fingers. This fact has been confirmed by other observers since. To be sure, these areas comprise only a very small part of the capillary field of the body, but in so far as they are representative they indicate that some of the blood in shock is stagnant and concentrated in the capillaries. Now cold will also produce stagnation and concentration of blood in capillaries. If you make a blood count from one of your hands when it is blue with cold, and compare it with the blood count in the other hand, which you have kept warm, you will find that the count in the cold hand is much higher than that in the warm hand. So it is quite possible that cold may cause stagnation in shock and may thus increase the state of shock by increasing the amount of blood which is out of circulation.

The observation which I suppose has been longest recognized as well established in shock cases is that there is a definite association between the chilling of a shocked man and the degree of shock; if a badly wounded man becomes cold he is likely to go into shock, and when he is warmed up he is usually greatly improved. There are various reasons why a wounded man will get cold. In the first place, he sweats a good deal; that is one of the first reactions observed in a badly wounded man, he begins to sweat profusely. Sometimes the badly wounded will complain more of their sweating than they will of their wounds. Through their wet clothes they lose heat by evaporation and conduction. Lieutenant Aub has found recently in the laboratory at Dijon that if the blood pressure falls to the neighborhood of 60 mm. of mercury there may be a reduction of the heat production of 50 per cent. The man in shock, therefore, is not only losing heat but is failing to produce it. You can see that there is every reason for paying particular attention to the warmth

of a shocked man. He ought to be protected first of all by proper blanketing so that such heat as he has does not escape. The blankets should be folded carefully underneath and over the man. By proper folding you can provide with three blankets, four layers above and four layers beneath. I regret to say that even in the cold weather of late October men were found coming in from a fighting area with four blankets—there was no lack of blankets—four blankets above them and nothing but the blood-soaked stretcher underneath. A man can lose heat through a wet canvas stretcher almost as readily as he can through a piece of sheet iron. There is no reason at all, with four blankets, why a man should not have an abundance of protection against heat loss, both above and underneath. Hot water bottles also should be applied. When the man reaches a hospital he should be undressed and put to bed. A fracture frame put over him and covered with blankets will permit hot air from a stove pipe or other source to be led in under the frame to keep him warm.

In this connection I may say that the warming of a shocked man will sometimes extraordinarily improve the blood pressure. I have seen a man come into a shock ward absolutely pulseless, and in forty-five minutes, after being warmed, he had a blood pressure of 110, a very satisfactory pressure. Never try the more complex measures of transfusion or infusion until you have seen what simple warmth and rest will do. Morphia should be given to quiet a shocked man. It diminishes the activities of the tissues and their demand for oxygen and it gives him comfort.

There is just one other point that I wish to touch upon and that is the sensitiveness of shocked men to anesthesia. If you talk to a surgeon about operating on a shock case, he will tell you he does not wish to touch the man because of the danger of operating. The hesitancy about operating is due to the fact that if the surgeon operates the blood pressure falls. In a series of cases which we studied we found that the blood pressure fell during operation from 88 systolic down to 62, and from 62 diastolic down to 31, a calamitous drop when you consider that the pressure was already so low as to be barely enough to keep the tissues properly supplied with oxygen. Accompanying the fall was a marked drop in the CO_2 content of the plasma. That is what is likely to happen when shocked men are operated upon. It was found in the laboratory that this was to a large degree due to anesthesia.

Here is a chart of an animal which had been in shock for some time and which was lying dulled and only slightly anesthetized. The wink reflex was present. To test the effect of anesthesia, the anesthetic was administered in all instances until the wink reflex just disappeared. In this first instance ether was given until the reflex disappeared, and a marked fall of pressure occurred. Here, again, ether was given and again there was a marked fall. If nitrous oxide is given, the effect will depend upon the relative amounts of nitrous oxide and oxygen. In this instance the fall was just about the same as with ether, but nitrous oxide and oxygen were used in the ratio of 6 to 1. In this instance it was 5 to 1, and here 4 to 1. The pressure, you note, was much reduced. Then a ratio of 3 to 1 was used with the same degree of anesthesia as before, and there was no fall of blood pressure whatever. There is no doubt that nitrous oxide is the anesthetic of choice in shock cases, and that it should be given with as much oxygen mixed with it as possible. If morphia is previously administered, the amount of nitrous oxide in relation to oxygen can be greatly reduced. Furthermore, many shocked men are dulled by the shock so they can be operated upon in analgesia and not under anesthesia. If the operation has to be done under ether, there is a means which can be used which will hold the pressure up, and that is to start transfusion, or infusion, at the beginning of the operation and let it continue gradually as the operation is going on. Pressure is thus held up to a proper level, the blood stream is kept going with no reduction in its rapidity, and the man gets through the operation in much better state than would otherwise be possible.

These are the main conclusions which I should draw from the considerations of the nature of shock which I have presented.

SEXUAL INFECTIONS IN AND OUT OF THE BRITISH ARMY

By Major J. BAYARD CLARK

Medical Corps, United States Army

DURING the spring months of 1918 I was given the opportunity, while in England, to visit and study at first-hand a fairly representative number (about half) of the hospitals devoted to the care of soldiers suffering from sexual infections. At the same time I was also able to learn something of the methods employed by the civil communities, working under the direction of the Government, in combating these conditions in civil life.

That the four years of face-to-face experience with these diseases, in and out of the army, and the consequent distraction of sorely-needed man-power, had awakened the British nation to a new sense of their sex disease situation, there was no doubt. The war had brought to light the smoldering embers, and the new war conditions had fanned these into flames; so the British people had nothing left to do but look the ugly evil in the face and start about fighting it down, as far as that was possible. This matter, therefore, became at once a subject of special interest to us in the United States, for we, too, are learning the lesson of its prevalence and destructive character.

My first glimpse of the "venereal" situation was in London, when I was directed from the office of the British Surgeon General to Lieut. Colonel Harrison, who was in charge of the Military Hospital, Rochester Row, and who was also the supervising officer of all the British war hospitals for venereal diseases. For the greater part of a week I visited Rochester Row daily and was taken by Colonel Harrison through the various wards and laboratories of the hospital, and from this experience was able to learn the ground work of the plans pursued throughout all the other hospitals England has instituted to cope with these diseases.

A few of these hospitals, such as Rochester Row and the Manchester hospital, were old buildings made over through war-time necessity; but the majority of those visited were built for emergency purposes on the pavilion plan, not unlike our own cantonment base hospitals, in many respects.

Rochester Row Hospital was a dingy-looking place from the outside, but inside it had been made fairly modern by means of elec-

tricity, plumbing and paint. That the War Office had made up its mind that old-time and half-way measures were not the means with which to conquer these diseases, I soon became aware. The first impression I got in that direction was in the kind of medical men chosen for the work, and the second impression was of the unstinted supply of scientific equipment at their disposal. In this short paper, written from the social rather than the scientific side, I will touch but lightly on the technical treatment of these cases.

Of special interest in reference to my visit to Rochester Row are some of the statistics and like data given to me by Colonel Harrison. He told me that Great Britain's venereal rate was 48 per 1,000 per annum for the entire army, for the entire period of the war to date; in other words, almost 5 per cent or 1 in 20. The British army in France has had a rate of 24 per 1,000 for the war to date. These figures have been steadily declining under their present improving system for handling these diseases. The sexual infestions, it was estimated, were divided as follows:

	Per cent.
Gonococcus infection	68
Syphilis	22
Chancroidal infection and balanitis	10

These figures were worked up out of 4,000 cases and seemed typical of all localities. The number of effectives continuously out of action through these diseases was best arrived at by the number of beds provided for them, and at that time there were about 20,000 in special hospitals holding anywhere from 500 to 3,000 patients each.

The study which showed the source of these infections has a good deal of value from the social or sociological standpoint. Figures from a very large number of cases showed that in about 75 per cent the infection was contracted not from the prostitute but from the "amateur" sex partner of the soldier; only a little above 25 per cent of the cases were contracted from the professional prostitute. As to prophylaxis, I was told that that was impossible on account of the church.

These, then, were the important and outstanding items of interest, aside from the scientific information given to me by Colonel Harrison, and a little thought on the subject with our own problems before us will show how important they really are.

My next visit was to the Chiseldon Camp Hospital for Venereal Diseases, in Wiltshire, not far from Salisbury Plain, where lies the famous Stonehenge, that perpetual puzzle of antiquity and

perhaps England's rarest relic. Because I wished to see these hospitals in their workday clothes, as it were, I decided to drop in on them without previously appointing a time. In his office I found Maj. A. S. Williams, the officer in command; he had just finished his morning rounds. After introducing myself and stating my errand, that I had come to see and learn a little something of his establishment and the ways of running it, he received me in a most cordial manner and we started off to see the hospital. This was my first near view of the typical pavilion plan of British hospital designed and run especially for sexual diseases. Its capacity was almost 1,000 patients. In orderly rows were some fifty or sixty barrack-like buildings, which the British call "huts." These were roofed with corrugated iron and and walled with the same or a concrete composition. Lumber was too scarce for anything but doorways, window-casings and furniture. Neat cinder paths ran between the lines of huts. It was all very plain, but all very practical. We first stopped at a typical hut containing, the Major told me, 18 or 20 beds—a ward hut, as I remember, about 60 feet long by about 20 feet wide. As he pushed open the door, two or three sharp raps with the little cane he carried brought his soldier patients to a sharp "attention."

Being all "up" patients, they were dressed in the regulation hospital clothes of blue blouses and trousers and white neckcloths. As they stood by the benches or boxes on which they had been sitting, I looked about to see the beds and other furniture of the ward, but of beds I could at first see nothing. On shelves were pairs of blankets neatly folded, and below them against the walls leaned pairs of boards. These boards I soon discovered were the beds, which were set up by being rested at the head and foot on benches. The blankets were heavy and of the roughest texture. No wonder the British Tommy was so tough.

Next we stopped at a treatment hut, divided into two or three large rooms and fitted out with all necessary medical equipment. Then we visited the laboratory, which also was well equipped with the scientific necessities, but bare of all furniture save the essential shelves and tables and a chair or two. From the laboratory we went to a number of the other wards, then to the kitchen, mess hall, laundry and back with the major to his office. Everything in and out of the huts was as clean and neat as possible, and the work seemed to go forward with the best direction and energy. As the commanding officer pressed me to stay for mess with the staff, and

being anxious to hear more of the scientific side of the work, I remained. Having shown on what the British soldier was rocked to sleep, I will now relate how the British officer fared as to food in an army camp hospital in these days of the spring of 1918.

The officers' quarters and mess room consisted of a group of two or three huts much like the ones described but furnished with reed mats, wicker chairs and a few plain tables. There were not more than eight or ten medical officers on the staff in all. About one medical man to every hundred patients was the allotment I found typical of all the hospitals. The menu we sat down to consisted of a meatless sausage, and a dry boiled potato and a piece of war bread, following by a small single helping of sugarless and plain pudding, another slice of bread, a little margarine and a small piece of cheese. A small cup of "near" coffee was served later in the sitting-room to which we adjourned. These were the months when the British nation went hungrier than it would have been policy to make public. After this repast, I had a chance to go into the details of the medical care of their cases with the different members of the staff and to make notes of the points in progress the war-time experience was teaching these British medical officers. Again I was impressed with the high type of medical men chosen for this work and the real scientific interest which had grown up in the care of these patients.

The next hospital of this kind I visited was the Hilsea Hut Hospital for Venereal Diseases, near the quaint, seafaring town of Portsmouth, and not far from Southampton. Lieut. Col. W. G. Clement, who was in charge, met me in the same cordial way as had the others and opened his doors and books to me in the same friendly spirit. This hospital had a bed capacity of about 600 and a staff of five medical officers. On one side of the road were the huts equipped for the treatment and care of syphilis, and on the other for gonococcus infection. The general plan of treatment was the same as I had seen at Rochester Row and Chiseldon.

Then came my visit to the old college town of Cambridge where the Cherry-Hinton Hutment Hospital, of about 1,000 beds and run by eight medical officers, is located. This hospital was devoted to the care of syphilis and chancroidal infections. Major Gibson, who was in command, showed me about most thoroughly. Here the huts were spread over a large area and the space between buildings was all carefully cultivated by the patients; it was found possible to employ 50 per cent of their time at useful labor and productive

farming. This institution was a model of order and efficiency. I was taken to afternoon tea, the most important meal of England's twenty-four hours, for then it is that the Englishman opens his mouth and his mind at the same time. Again I found the staff composed of keen and enthusiastic men bent on making progress in this department of medicine.

In Cambridge is also the Barnwell Hut Hospital for gonococcus infections alone. When I called there I was taken about by Major Headley, who showed me their methods for the collective treatment of these cases. The hospital has a capacity of 500 beds in large ward huts holding 86 patients each. In Barnwell they have become experts in the matter of treatment and have but few complications; indeed the percentage of complications throughout all the hospitals I visited was very small. Complete control of the patients, uniform expert care and the hardy constitution of the soldier seem to be the reasons most evident for the successful care of these cases. A visit to one more of the hospitals the army has provided for the special care of venereal diseases, and I think the reader will have formed a fair idea of the British earnestness and energy employed in meeting the matter of this great social evil.

The Military Hospital, New Bridge Street, Manchester, is a good example of what the English have accomplished under stress of necessity in transforming an old and out-of-date building into a modern and sanitary hospital. This structure was the old Manchester Workhouse, which was founded in 1754, and which in 1916 suddenly became a highly efficient military hospital. Maj. Alexander Wilson, the officer in command, conducted me over the building, which had been arranged to accommodate some 800 cases. The service here was divided about evenly between syphilis and gonococcus infections, and there were six medical officers on the staff. Again I was impressed with the similarity of treatment in this institution with that of the others I had seen. Here, also, their results were excellent.

Now, what is the meaning of all this activity along a line of medicine which has been so systematically shunned, in the past, by the English-speaking nations. First, it was because man-power was needed, to the very last ounce, to bring the war with Germany to a successful issue. Second, it was the realization of this widespread condition of sexual disease which brought the wise leaders of the British Government to take action. This brings us to the civil side

of the question, and to what the civil population, aided by the government, is doing in this matter.

In the summer of 1916 a plan was put on foot by the "Local Government Board" to establish free diagnosis and treatment, in clinics and hospitals, in all cities and towns, for men, women and children suffering sexual infection. The government was to defray 75 per cent of the expenses connected with this work and the local communities 25 per cent. Up-to-date facilities were to be provided and trained medical men employed to carry on the work. It was proposed that the patients with these infections were to be treated in precisely the same clean and scientific way as patients suffering with any other kind of infection, and that these patients were to be protected from any kind of publicity which would tend to mark them out as in any way different from other sick people.

When, in 1918, I had the opportunity of learning something of the outcome of these plans, which had then been instituted for almost two years, it was not difficult to see how wise the British had been in discarding the old policy of indifference to these diseases. The clinics and hospitals were gaining the confidence of these unfortunate sufferers more and more, and they were beginning to learn and reap the benefit of scientific treatment.

What the British have accomplished in this direction has really been admirable; their war hospitals for venereal diseases stand out as one of the finest achievements of their Army Medical Department. They have laid the corner-stone of a new régime for us English-speaking people, and it is going to be hard for civil peace-time communities, either at home or abroad, to longer hide from their responsibilities in regard to this most prevalent and corroding evil.

EDITORIAL

LET'S TAKE OFF OUR CLOTHES!

No, there is not so much novelty in the idea as you might think, nor is there the least degree of levity in the suggestion when you once understand what it is that we wish to say. Thomas Carlyle, that master of satire, wrote a book entitled "Sartor Resartus" in which he flays many conventions and sniffs with a fine scorn at a number of the established customs of mankind in his civilization. In it, if we remember rightly, he somewhat cynically suggests that if we strip the judge, the statesman, the merchant and the laborer of their vestments—their "rind," so to speak—and jumble them up a bit, it would be a little puzzling to see where lies the difference which their vested (we use the word in both its senses) right allows them to assume.

What about it? Just this. In a recent editorial, under the title of "The Doughnut or the Hole," we suggested the value of constructive and the disadvantage of destructive criticism to us as members of a profession. We looked at it from the angle of external criticism; that is, of criticism of us by the laity. We whistled to keep up our own courage and we endeavored to demonstrate to our critics that it was possible that we were in reality deserving, at times—not always—of praise instead of blame. It can make but little difference to us, who are the fractions which make up the integer, what others say of us if we are not of one opinion in regard to ourselves.

With the editorial mantle we gracefully assume a certain amount of knowledge not vouschafed to mere ordinary people: furthermore, we are, like the minister, "three feet above contradiction." As an editor, we have had it borne in on us, by correspondence and through personal interview, that while, as a man and wife, we are privileged to indulge in domestic differences, woe betide the peacemaker who interferes therein. Alas, it is true with our differences, as with the family bickerings, that the amused bystander must go away with the opinion that we are ill-mated and doomed to a fall. Don't let's do it! And that brings us back again to the caption of this article.

When all is said and done, a practitioner of medicine is a practitioner of medicine whether he be in uniform or mufti, or guiltless of any raiment whatever.

Why not, then, take off our metaphysical clothes and meet on

common professional ground, where there shall be no disturbing raiment to confuse our eyes and irritate our tempers? What is the difference between a "Regular," a "Reserve," a "Militiaman," a "City Practitioner," or a "Country Doctor"? Not one thing save the clothes they wear, *and* what they are worth without them. It seems to us that if we could at least mentally disrobe, forget suspicions, lose our fear either that we may be patronized on the one side or sneered at on the other, and meet on the plane of a common cult without any trappings, we might each of us, all of us, come to an easy and comfortable understanding which would allow us to appreciate that we all have proved, in the main, good fellows and very well worth more intimate cultivation. We are speaking with entire frankness on this matter, and, as an editor, hold no official brief. We may add, also, that we do not as an individual.

It is beyond the peradventue of a doubt that this war into which we were so ruthlessly shoved, ought to be, and has been, the greatest melting pot into which we could have been thrown. When has there been so excellent a chance for each of us to see how the other half lives? Yet we wonder if advantage of this opportunity has always been fully taken. How many of us have lost sight of what we are without our clothes—just brethren of the same profession? How many of us have allowed the external difference to start us with a small dubious suspicion in the bottom of our minds which we have unconsciously allowed to grow until it has, at least in some instances, reached undesirable proportions? It is not for us to gainsay that there have been instances in which grievances were justly held, but as long as it is simply a case of "I do not like thee, Dr. Fell" it is absurd and untenable as a general proposition.

You can take it that the world at large is not going to do a thing for us until we set our house in order and make our demands a harmonious whole. It seems absurdly evident that during the time we of the profession in arms have served together, we have each learned from the other many things. If that be the case, why not mutual acknowledgment and a happy frame of mind all around. No business, no trade, no corporation can hope to live and advance without a very certain and secure solidarity as a basis for progress, and what is true for them is just as applicable to us of the profession of medicine, no matter in which of the different classifications we may have happened to fall.

It is entirely probable that, as time goes on and mellows our views, we shall be more absorbed in the thought that we were

privileged to be commissioned and serve in the hour of the country's need than that sometimes some of us did not receive the appreciation we believed we deserved; or that we may have been looked down on by eminent specialists, who were amused at our earnest efforts along service lines which at first were not understood. Granting the truth of that supposition, what is the use in wasting the time which may be necessary to bring about this condition when we can step into it at once by stepping out of our clothes?

JAMES ROBB CHURCH.

IN FLANDERS FIELDS

It is fundamentally true that the profession of medicine is based on hard and uncomprising facts. We deal with much that is sordid and, for the most part, our path lies along the way of realism, seeing many sad things, some that are grim and occasionally those which are terrible.

In spite of this it cannot be denied that in our daily tasks we often skirt the edge of romance, and that joy and pathetic sorrow are above us as the clear sky and the clouds which float over it.

Because a man is a doctor does not predicate that his soul is inexorably fettered by the bonds of the body to which he ministers, nor that he can see no farther than the tools of his trade. We are sometimes inclined to believe that because he is on more or less intimate terms with the two great mysteries of life, birth and death, there is given to him a clearer vision, a more perfect appreciation of the wonder of it all than is the portion of some of the rest of the world which is concerned only with the middle ground of existence, the daily question of living.

If we add to this the power of expression, it seems manifest that the result will be the written evidence in prose or poetry, of things which, though perhaps seen by others, are viewed only subconsciously and take no visible or tangible shape.

Keats, if we remember correctly, was an apothecary's clerk; Weir Mitchell is a name to conjure with in the realms of medicine, and who does not know of the children of the busy brain of Dr. Oliver Wendell Holmes?

As flowers spring from the black mould, so the mud of the trenches, the stained and harried ground of No Man's Land, has given birth not only to good prose, but to some fine verse which breathes the spirit of uplift as it should since it was watered by the blood of those who were not afraid to go out and give all that men can for an ideal.

It seems to us, that of all this harvest of war time poetry the most touching appeal, that which really wrings our hearts, was—is—the sonnet written by Lieut. Col. John McCrae, of the Canadian Army Medical Corps, who gave to us "In Flanders Fields" and to his empire, in the line of duty, his life.

It is not an extravagant statement to make, that of all the war poems written, these lines of his are probably the best known. All the Army knew them, and they were passed along by word of mouth as Masonic ritual is transmitted.

The thought which underlies them, the pathetic appeal, the fierce invective—all arrest the attention and bring vividly forth the duty which they demand.

As a poem, it is cunningly wrought and carefully balanced: the whole composition just *sings* of itself. As Sir Andrew Macphail (himself a medical officer) says in his appreciation of John McCrae: ". . . the skill with which the rhymes are chosen. They are vocalized. Consonant ending would spoil the whole effect. They reiterate O and I, not the O of pain and the Ay of assent, but the O of wonder, of hope, of aspiration; and the I of personal pride, of jealous immortality, of the Ego against the Universe."

He has analyzed, with the sure knowledge of the trained man of letters, this remarkable bit of versification, and any attempt on our part to add to it would be no less than presumption.

This, then, we leave to him. What concerns us is that, though most of us know "In Flanders Fields" and many of us know that it was written by John McCrae and first published in London *Punch,* there are many of us who do not know that it is the work of a member of our profession, of a man who, besides standing high in the technicalities of his chosen work and meriting the admiring respect of his superiors, was also a poet who saw with clear eyes the spirit as well as the flesh which enchains it, and could so put it as to enable us to see with him.

It was the privilege of the editor to know John McCrae personally in France, and it is pleasant to be able to affirm that the many charming things which Sir Andrew Macphail says of his character were very evident to those who had the good fortune of his acquaintance.

We last dined together in Paris on the 28th of March, 1916. On January 28, 1918, he died from double pneumonia, at his place of duty, Canadian General Hospital No. 3, at Boulogne. On March 28, 1919, at eight in the evening, three years to the hour, we first

read the little book prepared with such loving care and skill by his lifelong friend, Sir Andrew Macphail.

We print below (by permission of the publishers), for the benefit of those who may not know it and for the satisfaction of those who do know it, the words of the sonnet.

A notice of the publication will be found in the Book Reviews.

JAMES ROBB CHURCH.

IN FLANDERS FIELDS

BY JOHN MCCRAE

In Flanders fields the poppies blow
Between the crosses, row on row,
That mark our place; and in the sky
The larks, still bravely singing, fly
Scarce heard amid the guns below.

We are the Dead. Short days ago
We lived, felt dawn, saw sunset glow,
Loved and were loved, and now we lie,
In Flanders fields.

Take up our quarrel with the foe:
To you from failing hands we throw
The torch; be yours to hold it high.
If ye break faith with us who die
We shall not sleep, though poppies grow
In Flanders fields.

A MESSAGE FROM OUR OWN "C. IN C."

In the March issue we published an extract from the *British Medical Journal* quoting Sir Douglas Haig's appreciation and commendation of the service rendered by his Medical Corps. It is with more pleasure that we note herewith the opinion which our own "C. in C." holds in regard to our service. We are modest, of course, but not too modest to believe that what he says we have merited.

Anyone who knows General Pershing has no mistaken idea as to his entire frankness in placing both praise and censure where they rightly belong. The following states in no uncertain terms his valuation of the Medical Corps which served him and should be not only a matter to be proud of, but a spur to further effort.

J. R. C.

[Copy]

AMERICAN EXPEDITIONARY FORCES

OFFICE OF THE COMMANDER-IN-CHIEF.

FRANCE, *February* 20, 1919.

COLONEL WALTER D. MCCAW, M. C.,
Chief Surgeon, A. E. F.

MY DEAR COLONEL MCCAW:

Now that active operations are at an end, and many officers and enlisted personnel are preparing to sever their connection with the military forces and return to civil life, I desire to express my personal appreciation and thanks and that of your fellow-members of the American Expeditionary Forces to you, and through you to the members of your department, for the splendid services they have rendered.

At the front and in the long chain of hospitals extending down to the base ports, I have watched the fine and unselfish character of their work, and the achievements which have added new glory to the noble professions they have so ably represented. Many of them have shared with the line troops the hardships of campaign conditions and have sustained casualties and privations with fortitude that is beyond praise. No labor has been too exhausting and no danger too great to prevent their full discharge of duty.

A special word of thanks is due to those members who were attached to and served continuously with the armies of our Allies. Their efficiency and high ideals have called for the highest praise of the allied governments under whom they have served.

Before they leave France, will you convey to all ranks under your command the deep sense of my personal appreciation of their splendid services and my regret at the impracticability of sending each and every one of them a letter of thanks?

Sincerely yours,
(Signed) JOHN J. PERSHING.

NONCOMBATANTS

The following statistics as furnished us by the Surgeon General of the Army show the toll that our Sanitary Service has paid during our part of the war in Europe.

In general, we believe that the layman is apt to think of the medical officer as one whose duties are such that he is not necessarily exposed, as are his brothers of the line, to the shock of conflict. Any consideration will show that this is far from being an actuality. Where there are troops in action, there of necessity must be those to retrieve them when they fall and furnish to them the first and most important care prior to their being sent back for the final patching up and repair. Duty of this sort devolves on the regimental personnel and upon those who work in the advanced dressing stations and sanitary formations.

If a "noncombatant" means one who does not actually bear

arms, who does not fight with rifle, bayonet or grenade against an opposing force, then those of the Sanitary Service in the front lines are so properly classified. But if we take in consideration the fact that in their constructive work with the wounded they are exposed to the same hazard and danger as their fighting brothers of the line, it seems as though there ought to be some distinction made which will indicate that, in addition to rendering the services appropriate to their profession, they do so at the same risk of life and limb as their combatant brothers.

The percentage of loss to the Sanitary Service in comparison with the line has not been worked out, but the figures in the following table are sufficient to show that in war our profession, the profession of military medicine, has given, as has always been the case, freely and without stint not only of its skill and knowledge but also of its flesh and blood.

J. R. C.

March 24, 1919.

Memorandum:

FOR PUBLICATION

1. There were four hundred and forty-two (442) casualties among medical officers of the American Expeditionary Forces in France from July 1, 1917, to March 13, 1919, divided as follows:

Died of wounds	22	Prisoners not wounded	38
Died of accident	9	Suicide	3
Died of disease	101	Wounded in action, degree undetermined	47
Killed in action	46		
Lost at sea	4	Wounded in action, severe	93
Missing in action	7	Wounded in action, slight	72

For the Surgeon General:

C. R. Darnall,
Colonel, Medical Corps.
Executive Officer.

AS REGARDS PUBLICATION

By request of the Surgeon General we publish, with this, data in regard to the publication of articles written by medical officers in the service and by those who have been recently discharged.

In connection therewith we desire to call attention to the fact that we shall be glad always to receive preference in regard to the publication of articles which deal with problems of the services, and that, through the medium of The Military Surgeon, matter of this kind will probably come to the notice of a larger number of those interested in military medicine than if turned over to one of the lay journals.

Our circulation at present is nearly nine thousand and, as stated

in a recent editorial, the journal goes to practically every corner of the world. J. R. C.

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Army Medical Museum and Library, Washington.

March 20, 1919.

MEORANDUM FOR: Editors of Medical Periodicals.

As stated in the circular memoranda for Editors of Medical Publications issued by the Surgeon General's Office on March 27 and May 22, 1918, it is required by paragraph 423, Manual of the Medical Department, that all medical manuscripts by medical officers, U. S. Army, intended for publication, shall be first submitted to the Surgeon General's Office, Washington, D. C., for approval. This regulation, which has been very courteously complied with to date, is still in force as far as medical officers on active duty are concerned. In the case of medical officers recently retired from active duty, it is requested, as a courtesy to the Surgeon General and in aid of assembling material for the Medical History of the War, that all medical manuscripts based upon military or official records or upon military experience during the war be submitted, as heretofore, to the Secretary, Board of Publications, Surgeon General's Office, Washington, D. C., for record and approval and that such MSS. be accompanied by a carbon copy. Upon approval, the original copy will be forwarded to the journal designated for publication, and the carbon will be filed in the records of the Medical History of the War.

For the Surgeon General:

(Signed) C. R. DARNALL,
Colonel, Medical Corps, U. S. A.
Executive Officer.

RECIPROCITY

At a meeting of the Executive Council held on March 20, the following resolution was passed: "That it be the policy of The Association hereafter to furnish the author of any article published in THE MILITARY SURGEON with one hundred free reprints without cover, if so desired."

It is our recollection that formerly it was customary to furnish contributors a certain number of reprints of accepted articles, but that the practice was discontinued due to straitened financial circumstances.

We are glad to have the opportunity of announcing the resumption of this practice and trust it may serve as an earnest that we are not desirous of maintaining a policy of "Something for Nothing."

It is hoped that as the membership increases—and we count on each of you to help increase it—it may be possible to adopt a more liberal policy. In the meantime we trust that this action of the Council will serve as proof that we are not all "take" and no "give."

J. R. C.

COMMENT AND CRITICISM

MEDICAL HISTORY OF THE WAR[1]

2. *Prospective.*—During the period of the Civil War, and long after, there were only two main grand divisions of practical (as distinguished from laboratory) medicine, viz., internal medicine and surgery. Sanitation, which became an applied science through the development of bacteriology, did not then exist, in the modern sense. There were no uniform quarantine regulations in the United States before 1893; and, prior to 1901, only ten states of the Union had even a satisfactory method of recording vital statistics. Subjects like Neurology, Psychiatry, Urology, Ophthalmology, Orthopedics, Radiology and Dentistry were as yet only vaguely outlined as definite specialties. It was natural, therefore, that the "Medical History of the Civil War" should have been almost entirely confined to the two main subjects, internal medicine and surgery. Up to the time of Letterman's reforms, the ambulance, field hospital and supply service of the Union Army had been experimental and inadequate. Apart from two brief chapters on hospitals and transportation, little is said about medico-military organization and sanitation in the "Medical and Surgical History of the Civil War." Although there is some evidence of sanitary inspection of camps and hospitals in "Medical Series," Volume I, including a questionnaire for hospital inspectors by Tripler (p. 59), it was largely due to the agitation and propagandism of the Sanitary Commission (organized June 9, 1861), that this phase of military hygiene became better established in the Union Army.

In the proposed Medical History of our participation in the present war, it will be necessary to render account of work done in a great many branches of modern scientific medicine as well as of the improved modern organization of military medicine. From the viewpoint of medico-military administration, the paramount subjects are Personnel, Finance and Supplies, Hospitals and Sanitation (including Prevention of Infectious Diseases and Statistics), Internal Medicine and Surgery. We find these subjects strongly featured in the Surgeon General's Office administration, both in the United States and on the Western Front. But in addition to these, there are a number of other subjects which have become

[1] Continued from March issue of MILITARY SURGEON.

outstanding in the present war, notably, Aviation, Gas Defense, Physical Reconstruction, Psychology, and others, such as Neurology, Psychiatry, Urology, Orthopedics, which are in reality subdivisions of general medicine or surgery. With the war at an end, our contribution to these subjects will probably not be large, at least, in comparison with the four years' accumulation of Great Britain or France. Nevertheless it is necessary and desirable to give an account of what has been done in them.

The subjoined schema, which has been carefully revised by General Ireland, is printed as a tentative plan for the arrangement and composition of the prospective history. The final assignment of editors or authors to the separate volumes and chapters, which has also been revised by the Surgeon General, will not be made public until it has been definitely ascertained that each officer proposed has accepted his assignment and that he is actually at work on his task. The main division of work will be: (I) Narrative (Western, Southern, and Eastern fronts), (II) Administration (S. G. O. and Chief Surgeon's Office, A. E. F.), (III) Statistics, (IV) Sanitation, (V) Training Camps, (VI) Hospitals, (VII) General Medicine (including Communicable Diseases), (VIII) Neurology, (IX) General Surgery, (X) Gunshot Wounds, (XI) Pathology (including Catalogue of Pathological Specimens), (XII) Physical Reconstruction, (XIII) Aviation, (XIV) Gas Defense, (XV) Graphics.

If the plan submitted is carried out, these volumes will necessarily be of much smaller size than the unwieldly "family Bible" format of the older "Medical and Surgical History of the Civil War" and, if possible, will approximate more to the accepted "world format" for scientific periodicals of which there are now examples enough in our current medical periodicals (The Military Surgeon, *American Journal of Physiology, Index Medicus,* etc.).

Separate themes will be individualized under the names of the different contributors, after the British plan, rather than bureaucratized in a lengthy continuum after the fashion of official reports or of the "Medical and Surgical History of the Civil War" itself. It is only by selection and condensation of material, as our English allies have found, that the immense amount of medical research made in this war can acquire any positive value, whether for scientific record or as a source of information for those engaged in future wars. The admirable publications issued in serial form by the English Medical Research Committee during the war period

afford excellent models of the kind of compression of material and individualization of subjects which will be necessary in work of this kind. As already stated, the British plan anticipates shaping up the vast material now, so that the records may be transmitted to the pension authorities as a finality. The monographs thus far published by the English Committee indicate the sensible plan of dealing only with those subjects which have become outstanding and difficult problems during the recent war.

Some recent investigations of the clinical and surgical records of our base and general hospitals suggest that, outside of rare and unusual cases, there will be few case histories available as literary material. Most of these records are so fragmentary as to be of no literary value whatever. Whatever data they may supply of value will be found on the punched soldiers' cards in the Division of Medical Records, Surgeon General's Office. These cards can be so manipulated by the sorting machines that the total figures for any data which they may afford can be obtained in a few minutes. With this prospect, it is probable that much valuable information may be obtained for scientific purposes from the soldiers' cards. Meanwhile, all case histories of unusual interest or value will be printed and there is a large assemblage of neurological cases. Apart from these, under stress of war conditions, there was little time for the writing up of routine cases in medicine or surgery.

For the sections on Pathology and Training Camps and Hospitals, instructive models are afforded in the Catalogue of the Surgical Section of the Army Medical Museum, prepared by Brig. Gen. Alfred A. Woodhull in 1886, and in the collective accounts of the U. S. Army camps, barracks, hospitals and posts, assembled and edited by the late Col. John S. Billings in 1870.

The subjoined layout has been developed, through the coöperation of the Surgeon General and his Division Chiefs, after the general plan of the English Editorial Committee, as stated by Sir Walter Fletcher (November 15, 1917):

> It was made clear at the beginning that the collection of material was to be encouraged, the publication of work done was to be allowed as freely as possible (subject to ordinary military censorship) and that the future History would aim at taking up and combining published and unpublished work, with full recognition of individual authorship. We foresaw the Medical History as an analogue of, say Allbutt's "System of Medicine," in which, while separate sections have individual authors or editors responsible for their preparation, full acknowledgment is made of the authorship of all material brought into contribution to the whole.

The principal difficulty thus far encountered in the way of carrying out this program is in the disclination of volunteer officers retiring from active duty to take up additional work, on account of the demands of their academic and professional avocations. It is none the less incumbent upon each officer who has received an assignment in the subjoined schema to do his bit, not merely as a matter of patriotism, but as a courtesy to the Surgeon General and as a duty to himself and his Corps.

TENTATIVE PLAN OF "MEDICAL HISTORY OF THE WAR"

I. A. Introduction. (Letter of transmission to the Secretary of War comprising a summary of the History of the Army Medical Department and its participation in the European War. By the Surgeon General.)
   B. Narrative. Field Reports. War Diaries.
   A. Outline of History of European War in relation to its effects upon General Medicine.
   B. Effect of the War upon Military Medicine.
   C. Reports of Division Surgeons and other officers at the front on battles and extended military operations.
   D. Italian Front (Reports from):
      1. Activities Base Hospital No. 102.
   E. Russian unit.
      1. Siberian Division.
   F. Serbian experiences.
   G. Chronological Table of Killed, Wounded and Missing.
   H. List of Medical Officers killed in battle or died from wounds and disease.
   I. Miscellaneous data for ready reference.
II. Administration. United States.
   A. History of Administrative Expansion of the Surgeon General's Office.
      1. Finance and Supplies.
      2. Personnel.
      3. Hospitals.
      4. Sanitation.
      5. Laboratories and Infectious Diseases..
         a. Communicable Diseases.
         b. Epidemiology.
         c. Army Medical Museum.
         d. Army Laboratory Schools.
      6. Internal Medicine.
         a. Cardio-vascular section.
         b. Tuberculosis.
      7. Neurology and Psychiatry.
      8. Venereal Diseases.
         a. Urology.
      9. General Surgery.

10. Surgery of the Head.
    a. Ophthalmology.
    b. Oto-rhino-laryngology.
11. Orthopedic Surgery.
12. Röntgenology.
13. Physical Reconstruction.
14. Psychology.
15. Food.
16. Air Service.
17. Chemical Warfare.
18. Dental Corps.
19. Veterinary Corps.
20. Army Nurse Corps.
    a. Army School of Nursing.
    b. Assignment of Red Cross Nurses.
21. Medical Officers' Training Camps.
22. Ambulance Service.
23. Library of the Surgeon General's Office.
    a. Medical History of the War.
24. Attending Surgeon, Washington. D. C.
25. Oversea Division.
26. Liaison officers in Paris.
27. Liaison officers in London.

B. Correlated Activities (to be treated briefly in a single narrative).

1. United States Public Health Service.
2. American Red Cross.
    a. Mobilization of 50 base hospitals.
    b. American Red Cross in France.
3. Council of National Defense.
    a. National Research Council.
4. United States Navy, Bureau of Medicine and Surgery.
5. Adjutant General's Office.
6. Provost Marshal General. Mobilization Section, Medical Subsection.
7. War Department Commission for Medical Training Camp Activities.
8. General Staff, United States Army. Weekly medical reports (Statistics).
9. General Staff, United States Army: Military History of the War.
10. War Department: Militia Bureau. Medical Section.
11. Inspector General. Medical Bureau.
12. Signal Corps.
13. United States Shipping Board: Emergency Fleet Corporation. Division of Health and Sanitation.
14. Bureau of Standards.
15. Federal Board of Vocational Education.
16. Women's Overseas Hospitals.
17. Civilian War Hospitals.
18. American Medical Association.
19. Rockefeller Institute.
20. Infant Welfare Units (in France).

21. Rockefeller Foundation.
    a. Harvard University: Work on Wheat Substitutes.
22. War Risk Insurance.
23. Red Star (Animal Rescue).
24. United War Work Campaign (Chartered October, 1918).
25. Carnegie Institution of Washington.
    a. Nutrition Laboratory.
26. Women's Auxiliary Committee for War Work.

III. Administration. Western Front.

1. Chief Surgeon's History.
2. Finance and Accounts.
3. Hospitals.
4. Supplies
5. Sanitation and Epidemiology.
    a. Sanitary Inspection of Hospitals.
    b. Laboratories.
        (1) Central Laboratory.
    c. Infectious Diseases.
    d. Statistics.
    e. Research Work and Research Society (Red Cross endowment).
    f. Sanitary School.
6. Personnel.
7. Transportation.
    a. Evacuation to fixed formations.
    b. Ambulance Service with French Army.
    c. Hospital Trains and Hospital Barges.
8. Red Cross (see II, B, 2b).
9. Field Organization.
10. Line of Communications.
11. Tactical administration of medical units at front.
12. Training Section: General Staff.
13. Mobile Operating Units.
14. Sanitary Squads.
15. Convalescent Camps and Rest Camps.
16. A. E. F. Activities and Establishments in England.
17. Internal Medicine.
18. Surgery.
    a. Orthopedic surgery.
    b. Neurological surgery.
    c. Maxillo-facial surgery.
    d. Roentgenology.
    e. Research work.
    f. Genito-urinary surgery.
19. Ophthalmology.
20. Oto-rhino-laryngology.
21. Dentistry.
22. Psychology.
23. Nursing.

IV. Statistics. Mathematical Interpretation of Data. Anthropometry.

V. Sanitation *A:* In the United States, including Insular Possessions.
1. Medical Department Administration and Sanitation of Camps, Cantonments and other Stations.
2. Current Vital Statistics.
3. Vital Statistics and Medical Records.
4. Sanitary Inspection.
5. Sanitary Engineering.
a. Water Supply, Sewerage Systems, Sewage and Garbage Disposal.
b. Mosquito and Fly Control.
6. Food and Nutrition.
7. Physical Examination.
8. Vermin Inspection and Sanitary Process Plants.
9. Student Army Training Corps.
10. Development Battalions.
11. Sanitary Administration of Ports of Embarkation (including transports).
12. Communicable Disease Section during its inclusion in Division of Sanitation will be covered in Vol. VIII.
13. Sanitation in the Philippines, by Department Surgeon.
14. Sanitation in Hawaii, by Department Surgeon.

B. Sanitation Abroad.
1. Sanitation of American troops in France.
2. Sanitation of American troops in England.
3. Sanitation of American troops in Russia.
4. Sanitation of American troops in Siberia.
5. Sanitation of American troops in Italy.

VI. Camps and Cantonments.
A. Introduction.
B. Individual histories of Camps and Cantonments (with photographic illustrations).
C. Individual histories of Military Training Areas, Western Front.
D. Medical Officers' Training Camps.
a. Individual histories of M. O. T. C.

VII. Hospitals.
A. Introduction.
B. Individual Histories of Base Hospitals, General Hospitals and Special Hospitals in the United States during the war period.
C. Organization of Hospital Centers and Histories of U. S. Hospitals on Western Front.

VIII. General Medicine.
A. Introduction.
B. Communicable Diseases.
1. Anthrax.
a. Industrial aspects of anthrax.
2. Bronchopneumonia.
3. Cerebrospinal meningitis.
4. Empyema.
a. Streptococcus empyema.
b. Experimental treatment.

5. Erysipelas.
6. Influenza.
7. Measles.
   a. Measles-pneumonia.
8. Parotitis.
9. Pneumonia.
10. Smallpox.
    a. Intradermal vaccination.
11. Tuberculosis.
12. Typhoid Fever.
13. Typhus Fever.
14. Venereal Diseases.
    a. Syphilis.

C. Diseases due to Animal Parasites.
   a. Dysentery (including ciliate and flagellate infections).
   b. Hookworm infection.

D. Diathetic Diseases.
E. Cardio-vascular Diseases.
F. Disorders of Digestion.
G. Diseases of the Skin.
H. Trench Diseases.
   1. Trench Fever.
   2. Trench Nephritis.

IX. Neurology.
A. Insanity.
B. War Neuroses.

X. Surgery.
A. Introduction.
B. Asepsis and Antisepsis.
C. Anesthesia.
D. Surgical Matériel.
E. Conspectus of Surgery of the Advance, Line of Communication and Base.
F. Surgery of the Nervous System.
   1. Surgery of the Peripheral Nerves.
   2. Surgery of the Cranium, Brain and Spinal Cord.

G. Maxillo-facial Surgery.
H. Surgery of the Chest and Thoracic Viscera.
I. Surgery of the Abdomen and Abdominal Viscera.
J. Surgery of the Genito-Urinary System.
K. Surgery of the Vascular System.
L. Orthopedic Surgery.
   1. General Scope of Orthopedic Surgery.
   2. General Scope of Orthopedic Surgery, A. E. F.
   3. Pre-combat Activities in America.
   4. Pre-combat Activities, A. E. F.
   5. Standardization of Splints.
   6. Front Line Orthopedic Surgery.
   7. Orthopedic Work in the Evacuation Hospitals, A. E. F.

8. Orthopedic Work in Base Hospitals, A. E. F.
9. Fractures and Dislocations.
10. Surgery of Joints.
11. Orthopedic Work in General and Base Hospitals in America.
12. Amputations and Artificial Limbs.

M. Ophthalmology.
N. Oto-rhino-laryngology.

XI. Gunshot Wounds.
A. Weapons and Projectiles.
B. Radiology and Localization of Projectiles.
C. Extraction of Projectiles.
D. Wound Shock.
E. Wound Infection.
1. Bacteriology of Wounds.
2. Gas Infection.
3. Tetanus.
F. Wound Treatment.
G. Treatment of the Slightly Wounded.
H. Excision and Suture of Wounds.
I. Burns.

XII. Pathology.
A. Catalogue of Pathological Specimens.

XIII. Physical Reconstruction.

XIV. Air Service.
A. Histories of Individual Aviation Fields.
B. Aviation at the Front.
C. Physiological Experiments.
D. Laboratory Work.

XV. Chemical Warfare.
A. Chemistry of Poisonous Gases.
B. Gas Mask Physiology.
C. Mustard Gas Lesions.
1. Treatment of Mustard Gas Burns.
2. Ointment Protection Against Mustard Gas.
D. Semeiology of Lung Irritant Gases.
E. Pathology of Lung Irritant Gases.
F. Experimental Treatment of Lung Oedema.
G. Susceptibility to Skin Irritants.
H. Chronic Effects of the War Gases.
I. Experimental Treatment of Gas Poisoning.
J. Gas Mask Service.
K. Gas Defense from Viewpoint of Division Gas Defense Officers.
L. Gas Defense Instruction in Camps.

XVI. Graphics (Miscellaneous photographic illustrations of Medical Department activities in the war).

CASEY A. WOOD,
FIELDING H. GARRISON.

CURRENT LITERATURE

Venereal Prophylaxis. Research Society Reports—*The Medical Bulletin*, vol. I, No. 7, Paris, May, 1918, pp. 492–516.

The subject of venereal prophylaxis was taken up and discussed during the third meeting, on April 20, of the fifth session of the Research Society of the American Red Cross in France, the ablest American representatives taking a leading part. While it is obviously impossible to do justice, within the prescribed limits of a necessarily brief abstract, to touch even the most prominent points in the argument and the advances recorded in the proceedings, it is, nevertheless, necessary to draw the attention of the readers of THE MILITARY SURGEON to a few points, inasmuch as the whole subject was presented especially in its relations to the American Expeditionary Forces.

Thus Maj. Edward L. Keyes, Jr., M. R. C., declared "that the campaign against venereal disease in the American Army was being conducted upon a new and unique basis." He presented a chart, received from the Office of the Surgeon General, classifying the "Attack upon Venereal Disease." No one can study this chart without coming to the conclusion that it is the most comprehensive document ever projected for the accomplishment of any definite end whatever. If the organization of such an ideally conceived plan should ever become realized and develop into an efficient coöperative body, syphilis will have to go and venereal disease, it would seem, be driven out of our army. The American soldier in uniform would signify the "noli me tangere" to the *Treponema*. Barring, perhaps, a few black sheep from among the army of venereal workers themselves, human as they are, there would soon be no real soldiers for treatment left. From a glance at this plan, it would seem as if all the men and women of the United States, between twenty and forty years of age, would soon find themselves divided into soldiers on one side and venereal disease fighters on the other. If the end is realized, the plan would be worth the price!

Major Keyes stated that "the theory upon which the control of venereal disease is based may be divided as follows:

1. "It is believed that the so-called sexual necessity of man is a relative and not an absolute condition which depends upon habit and circumstances as much as upon hereditary tendency. . . ."

2. "It is further believed that, although social, ethical, religious patriotic, and other emotional influences are of great importance in dealing with the problem, they cannot always be relied upon to hold the evil(!?) in check. Therefore the campaign is based essentially upon hygiene, for it is believed that the sex impulse can be curbed by hygienic measures."

Admitting, with the author, that such are our present beliefs, the results of the teachings of ages past, it may, nevertheless, be permissible to ask whether our premises for such beliefs are really sound and our postulates correct.

If our distinguished author, quoted in the preceding paragraphs, by the term "evil" means the *disease* engendered through the indiscriminate and promiscuous indulgence of sexual intercourse, no further contention is possible; if, on the other hand, he refers, by this term, to the sexual impulse, he might meet with some objections, on *theoretical* grounds.

It is a mere truism to say, if the medical profession were in possession of the means for sterilizing mankind of the treponema, promiscuous intercourse would concern that profession no further; it would be turned over to the lawyers. If anyone suggested the spaying of all sexually mature women and the sterilizing of the men, he would propose a great crime against his genus; depopulation would follow. The sexual impulse is looked upon in some countries, where depopulation, following birth control, is ripe, as a blessing. Why call it a blessing at one time and an evil at another?

Even in merely speaking of the sexual impulse in connection with a horrible disease, physicians at least should keep in mind that it is a perfectly normal physiological function, by heredity the oldest, the one immortal part of the cells of the metazoa, a necessary part of the perfect man and woman, to be kept, under our present civilization, under proper control and within ethical, decent, permissible and legally sanctioned lines. If, as our author states in the second paragraph quoted above, "our social, ethical, religious, patriotic, and other emotional influences . . . cannot always be relied upon to hold the evil (sic) in check" . . . and that "it is believed that the sex impulse can be curbed by hygienic measures," it would have to be confessed that: (1) our moralists, philosophers, religionists and patriotic enthusiasts are brought up against as difficult a problem as our physicians are in their efforts to combat the ravages of the treponema. (2) It may be said further without fear of contradiction, that if the sexual impulse can be "curbed" by being placed under the influence of hygienic measures, it would be the only known physiological function so to behave. To remind the reader of but one of these measures: athletics, so often invoked as antagonizing the sexual impulse. Every athlete, providing he is honest, and comes out of the game uninjured, will confess to you that the contrary is more to the point.

The preceding remarks are intended merely to modify some of our theoretical conceptions involved in the problem and upon which the report is said to be based.

Maj. George Walker, M. R. C., said that the method of dealing with venereal disease in the Army aimed, first, to prevent contact; and,

second, to require prophylaxis after exposure. He stated "that careful investigations at two ports of landing proved conclusively that houses were chiefly responsible for the incidence of venereal disease among American troops. Not uncommonly a woman in one of the houses might entertain as many as 80 men in the course of a day and as many as 25 in a single afternoon!" "Thus in the course of ten days 60 women might entertain 50,000 of the troops." He recommends prophylaxis after contact and short leaves. Various preventive measures were ably discussed by Majors Gougerot, Spillman, Dr. Thibierge and Hugh H. Young. Most impressive are the charts exhibited by Young on the good results obtained by prophylaxis and well calculated to convince those who are still doubtful of its benefits.

Finally, in a report from Major Gauducheau, of the Colonial troops, a prophylactic ointment was recommended consisting of: Thymol, 2.50 grams; Calomel, 15.00 grams; Vaseline, 10.00 grams; Lanoline, 80.00 grams. Thymol is supposed to produce an immediate antiseptic action.

H. G. Beyer.

L'avion radio-chirurgical "Aërochir," by A. Nemirovsky and Tilmant, read by Dr. Walther. *Bull. de l'Acad. de Méd.*, t. lxxx, No. 35, September 3, 1918, p. 202.

Many, indeed, have been the means and devices destined to be employed for the rapid transportation of the wounded to the surgeon or the surgeon to the wounded; numerous, likewise, are those who owe their lives and limbs to prompt surgical interventions. The invention of the "Aërochir" seems to "cap the climax!"

This *avion radio-chirurgical,* recently designed in France, is intended to carry radiographic and surgical aid almost instantly to either stations without radiographic and surgical material or to such surgical centers, momentarily overrun by wounded, for the treatment of which the installation is not prepared.

The *avion radio-chirurgical* consists in an aeroplane capable of carrying, besides the pilot, a surgeon and a radiologist as well as surgical and radiological material sufficient for all necessary interventions. The electric generator of the aeroplane is to furnish the current for the radiograph, and all that is necessary is a small transformer and an interrupter, mounted so fashioned as to be used either on the aeroplane or independently. The great advantages of rapidity, and of such a machine not encumbering or being encumbered by the traffic and convoys on the roads behind the firing line, must certainly appeal even to the imagination of the non-initiated. The report is accompanied by detailed illustrations.

H. G. Beyer.

ASSOCIATION NOTES

At a meeting of the Executive Council, held at the Army and Navy Club, Washington, D. C., Thursday, March 20, 1919, the following named officers were elected members of The Association of Military Surgeons of the United States:

U. S. P. H. S.

Acting Assistant Surgeon

Harry Logan Giles

Medical Corps, U. S. Navy

Commander

Paul T. Dessez

Lieut. Commander

Egerton Crispin

Passed Asst. Surgeons

Paul Francis Cope
Horace Victor Cornett
Marvin M. Gould

Lieutenants

John T. Bennett
Charles F. Bloom
William Walker Davies, Jr.
David Ferguson, Jr.
William B. Hare
Walter L. Hogan
Joseph P. Israel
Arthur S. Judy
Clifton F. West
Floyd McK. Baldwin

Medical Corps, U. S. Army

Colonel

Joseph A. Blake

Lieut. Colonels

Charles C. Hillman
Henry W. Hoagland
Nelson Este Nichols
George A. Renn
Walter H. Winterberg

Majors

Jacob F. Avery
Cornelius Oliver Bailey
Reed B. Bentecou
Guy Cluxton Boughton
Joseph P. F. Burke
George F. Chandler
H. A. Coleman
Aaron C. Conaway
Arthur Hallam Crosbie
Emory C. Gaffney
William P. Harlow

Majors—Continued

Henry D. Hatfield
Charles M. Hunter
Thomas Dreux Hurley
Allan S. Kirkwood
Benjamin F. Knause
Louis J. Ladin
H. B. McMurdo
Ralph T. Merrill
Victor C. Pedersen
Joseph A. Pettit
Charles E. Phillips
John J. Porter
Jos. Price
Don H. Silsby
Robert A. Strong
Eide F. Thode
William H. Tukey
Meyer Wiener

Captains

Ursa S. Abbott
Ralph V. Allen
Finis L. Anderson
Dailey Appleberry
Wm. D. Aufderheide
Albert E. Austin
William H. Axtell
Joseph L. Baer
Henry P. Bagley
Sanford Bailey
Theodore Bailey
Craig Barrow
Ezekiel M. Bartlett
William H. Beach
George E. Benson
Bert J. Bixby
Marco I. Blank
Charles L. Bossert
Thomas A. Boyan
Philip W. Boyd
Herman J. Brackney
J. Arvid O. Brennan
Frank Brockway
Frank M. Brooks
William W. Brothers
Francis E. Brown
Benjamin A. Brown
Oval N. Bryan
James A. Bryer
William S. Buckley
Stephen D. Bullington

Captains—Continued

William A. Bush
George E. Burdick
Arthur H. Butler
Cyrus D. Cantrell
Elias Caplan
Arthur J. Capron
James H. Carr
William J. Carter
Andrew J. Casner
Henry M. Cass
Bertram H. Caswell
Julius A. Chevigny
Paul M. Cliver
James J. Collie
Thomas S. Collins
Hugh M. Cox
Ambrose B. Crain
Young D. Craven
Andrew Crotti
James A. Davis
Charles M. Davis
Raymond Dawes
Ernest F. Day
Thos. F. De Naouley
Peter J. De Pree
Seine B. De Pree
Frederick E. Diemer
Fred A. Dillon
Perc Dolman
E. Lee Dorsett
Henry C. Dozier
Wm. S. Durand
Henry W. Dueringer
Richard J. Dwyer
John C. Dwyer
John C. Dysart
Ira W. Ellis
Seward Erdman
Louis H. Fales
Tracy Farnam
Alfred Fellows
Herbert H. Fisher
Gilbert Fitz-Patrick
Edward F. LaForce
Charles D. Freeman
Frank M. Gaines
James O. Ganoe
James A. Garland
John D. Geissinger
Harry R. Geyer
Charles E. Gillespie

Captains—Continued

William F. Gordon
Benjamin A. Graves
Robert E. Graves
Edward E. Green
John C. Griffith
Henry B. Grimes
John L. Grove
John C. Gunn
Eber W. Gurley
Ernst Haffner
Charles W. Halterman
John DeW. Hawks
Ralph R. Hendershott
Walker J. Highman
Bert C. Hiner
Walter O. Hopper
Harlan Horney
Frank S. Hough
Wm. F. Howat
Ira K. Humphrey
Charles B. Hussey
Edward H. Hutton
Edgar H. Irvin
Albert N. Jacob
Henry C. Johannes
Arthur L. Jones
Michael W. Kapp
Herman R. Kauffman
Edward H. Katterhenry
Charles A. Keating
Charles A. Kearney
William F. Keller
John Lee Kelly
James G. Kennedy
John T. Kent
Jay M. Kilborne
Arthur C. Kimball
Clarence E. Kinley
John A. Koch
Warren W. Koiner
A. C. Lancaster
Arthur E. Lane
William J. Lange
William O. Leach
Isidor Lebelson
Geo. W. Lipschulch
Charles LeR. Lowman
Henry A. Luce
Henry C. Luck
Gustav H. Luedtke
Gustav A. Mack
Bert E. Mankopf
Charles R. Marsh
Gilbert M. Mason
Clarence S. Maxwell
Malcolm McKinnon
Geo. C. H. McPheeters
Oscar E. McWillaims
Ralph W. Mendelson
William J. Meyer
Irvin Michlin

Captains—Continued

Frederick B. Miner
F. M. Summerille
Frank G. Morrill
Frederic S. Morris
John E. Mulsow
Edgar P. Murdock
Donald M. Myers
Clifford R. Neare
Archibald B. Nelson
Isaac E. Nervig
John Neuberger
Edward N. Packard
Byron W. Parrott
Geo. A. Peirce
A. L. Peters
Lucius B. Phelps
Edward J. Phillips
Orvan A. Phipps
William T. Phy
Lawence B. Pilsbury
Willian S. Porter
William A. Prouty
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BOOK REVIEWS

Practical Physiological Chemistry, Review of: Philip B. Hawk. Sixth Edition. Philadelphia: P. Blakiston's Son and Co.

The fact that a book has passed through six editions within eleven years is positive proof that it has satisfied a demand and has fulfilled its mission in a most satisfactory manner. This is certainly true of the work under review, for it is undoubtedly the best book upon physiological chemistry that is published in English.

The sixth edition has been thoroughly revised and brought up to date and several chapters have been added or practically rewritten. A new chapter upon "Acidosis" adds greatly to the value of the work, and the chapters upon Metabolism, Blood Analysis, Gastric Digestion and Quantitative Analysis of the Urine have been much expanded and include all of the most recent advances. Hawk has omitted all methods for the determination of urea, except those based upon the use of urease, and has substituted Van Slyke's procedure for the determination of acetone substances in the urine for previously included methods.

The book is especially valuable as a teaching manual by reason of the most careful and detailed manner in which the various tests are described, and it is not too much to say that the writer has never observed more easily understood directions for the performance of laboratory tests than are given in Professor Hawk's work. Each subject is discussed in a thorough and scientific manner and the experiments outlined are those best suited to demonstrate the principles advanced. The work can be cordially recommended to all medical men, but especially as a text-book for use in medical colleges and a hand-book for use in the laboratory.

The press work is admirable and the book is remarkably free from typographical errors. The illustrations are numerous and excellent, and the book is well and substantially bound.

Chas. F. Craig.

Essentials of Surgery (Lippincott's Nursing Manual), by Archibald L. McDonald, M.D., Formerly in Charge of Department of Anatomy, University of South Dakota; Lecturer in Surgery, Nurses Training School, Saint Luke's Hospital, Duluth, Minn. 46 Illustrations. Philadelphia and London: J. B. Lippincott Company. Price, $2.00.

Dr. McDonald has prepared for the use of senior nurses a useful addition to this series of manuals. Study of the book will give nurses a reasonable conception of surgical conditions and the indications to be met in treatment. An elementary knowledge of anatomy, physiology and bacteriology is assumed. The general principles of surgical diseases and the resulting pathological changes are discussed. The more important surgical lesions involving special parts of the body are presented under separate headings. Simple language is employed and the statements concerning etiology, pathology, the natural course of the disease and the indications for treatment are more or less general. Technical nursing methods are not dis-

cussed, except special indications for their use. The binding is attractive, the type is large, the illustrations are well drawn and the paper is serviceable. FRANCIS M. MUNSON.

IN FLANDERS FIELDS, AND OTHER POEMS, by Lieut. Col. John McCrae, M.D., with an Essay in Character by Sir Andrew Macphail. Illustrated. New York and London: The Knickerbocker Press, 1919. Price, $1.50.

This little volume of 141 pages gives us a very intimate insight into the character of John McCrae and shows what manner of man he was. It contains his poems, the best known of which is, of course, that from which the book takes its title. In addition to the verse there is also a series of letters written to his mother while he was a part of that man-made hell, the second battle of Ypres. To this is added a very scholarly and sincere appreciation of the man himself by Sir Andrew Macphail, who, in addition to his facility as a writer, had the advantage of a long and intimate acquaintance with McCrae. It is all interesting and very worth reading, the verses for their gracefully turned periods, and the letters for the intimate picture they give us of the hardships which were borne with cheerful heart and steady courage by those who drove doggedly through them ever hopeful and always unafraid.

The "Study in Character" is a well-written appreciation which, in addition to the grace of style, has a further value woven into it in the very evident affection and respect which this Soldier-Doctor-Poet inspired in those who were admitted to his friendship. Further notice of this work will be found in the editorial section. JAMES ROBB CHURCH.

CORRECTION

On page 424 of the April number of THE MILITARY SURGEON, "Surgical Treatment," by James P. Warbasse, was erroneously listed at $4.50 a volume. The sale price is $10.00 a volume, or $30.00 for the set with separate index.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

SURGICAL TREATMENT, Volume III, by James Peter Warbasse, M.D. Philadelphia and London: W. B. Saunders Company, 1919. Per set (three volumes and the Index Volume): Cloth, $30.00 per set.

ULTRA-VIOLET RAYS IN MODERN DERMATOLOGY, by Ralph Bernstein, M.C. Lancaster, Pa.: Achey & Gorrecht, 1919.

ESSENTIALS OF SURGERY, by Archibald L. McDonald, M.D. Philadelphia and London: J. B. Lippincott Co., 1919.

ELECTRICITY IN MEDICINE, by Geo. W. Jacoby, M.D., and J. Ralph Jacoby, A.B., M.D. Philadelphia, Pa.: P. Blakiston's Son & Co. Price, $5.00.

INSTRUMENTS AND APPLIANCES

A CYSTOSCOPIC TABLE DESIGNED FOR USE IN U. S. ARMY CANTONMENTS

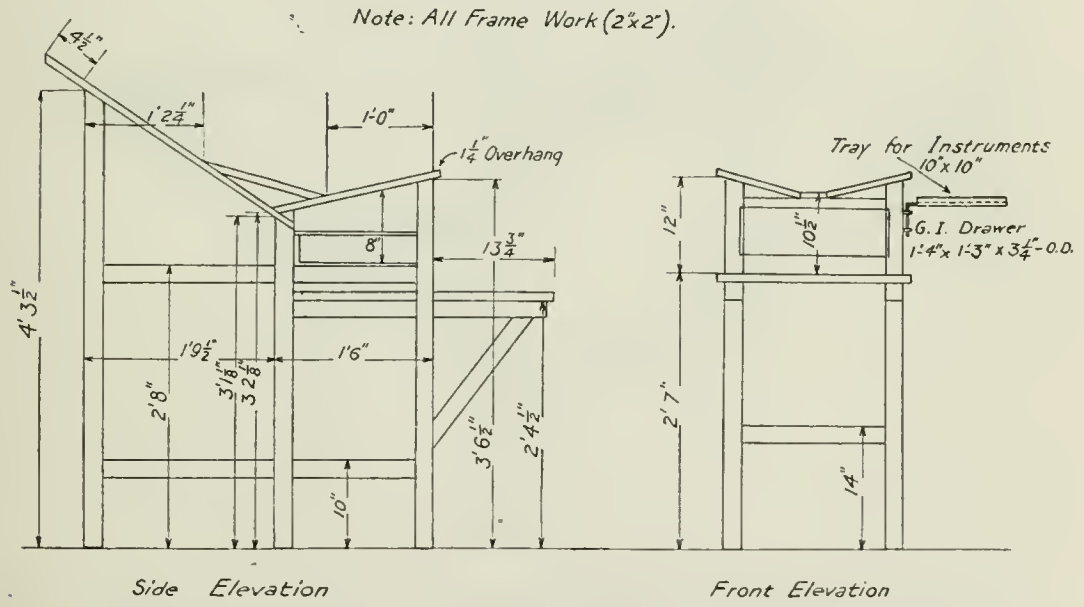
By Captain IVY ALBERT PELZMAN

Medical Corps, United States Army

(With two illustrations)

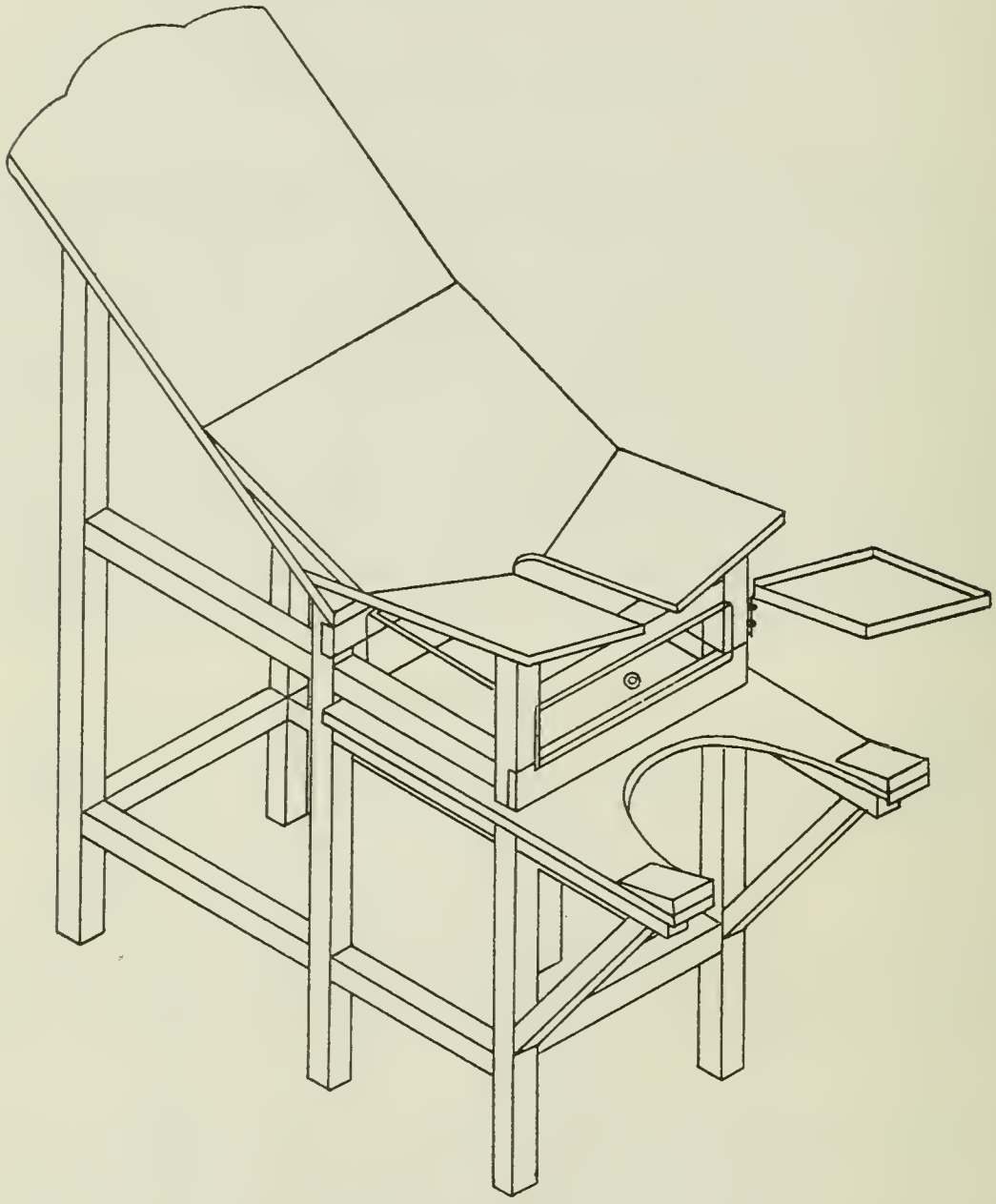
The urgent need for a cystoscopic table at the U. S. Army Base Hospital, Camp Meade, Md., led the writer to design and have constructed a wooden table which has proven so satisfactory that I think it of sufficient interest to publish the drawings of it.

Due to the extra support to the small of the back furnished by the extra back-rest extending from the lower portion of the back to the seat of the table, there is produced a posture of ease and relaxation to the patient. The extra back-rest obliterates the acute angle formed by the back and seat of the table and thus supports the small of the back unusually well, doing away with the pains in the back so often complained of by patients during cystoscopies.



A galvanized iron drawer was made to collect the bladder fluid, and a wooden tray was constructed for use as an instrument tray. By the use of two screw-eyes and a nail curved at a right angle, the tray is easily removed when not in use.

A similar table was constructed for use at the venereal station in camp, and in a large series of cystoscopies and endoscopies the table was found to be ideal, being unusually comfortable for the patient and convenient for the examiner.



The table is simple in design and the average carpenter can easily construct one. A few coats of white paint and enamel give the table a satisfactory finish and, when completed, it looks almost as well as the expensive metal cystoscopic tables.

A wooden stool simple in design, can be constructed for use by the examiner, should he prefer sitting during the examination.

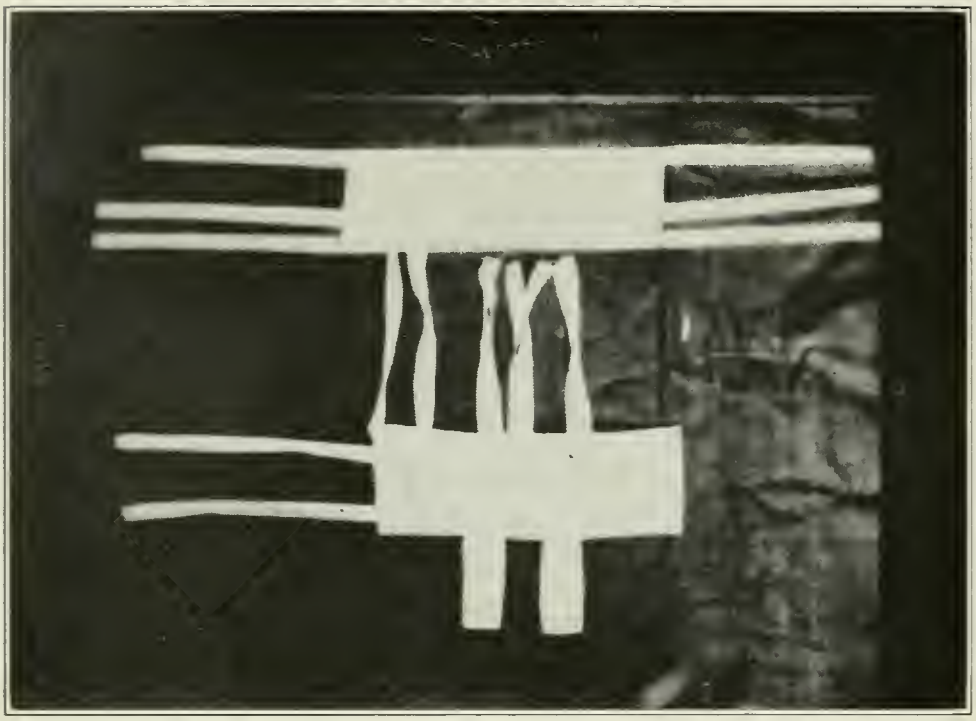


Fig. 1.

Fig. 2.

(To face page 541)

A SURGICAL DRESSING

By Major GUY C. BOUGHTON
Medical Corps, United States Army

(With two illustrations)

This dressing is devised to meet the requirements in cases of compound fractures of the jaw or infections of the face or neck, where it is necessary to change the dressings frequently, as in cellulitis of the face involving the tissues of the lower jaw and neck.

The head piece is applied as a permanent bandage, with the small tapes attached thereto, one behind each ear and two in front. Dressings are applied and held in place by the second piece of the bandage, this having six tapes attached, which tie to the corresponding tapes on the permanent headpiece.

With this arrangement dressings can be changed frequently and held in place with absolutely no discomfort to the patient, not possible with the old method of a roll bandage.

Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

Surgeon Donald H. Currie, U. S. P. H. S.
Died December 23, 1918.

Maj. T. W. Evans, M. C., Wisconsin N. G.
Died January 27, 1919.

1st Lieut. Angelo Festorazzi, M. C., Alabama N. G.
Died January 18, 1919.

Capt. A. M. Foster, M. C., U. S. A.
Died September 2, 1918.

Capt. Walter S. Johnson, M. C., U. S. A.
Died February 19, 1919.

1st Lieut. Philip M. Kyser, M. C., U. S. A.
Died March 15, 1919.

Col. G. L. Porter, M. C., Connecticut N. G.
Died February 24, 1919.

Lieut. Col. William E. Purviance, M. C., U. S. A.
Died December 25, 1918.

1st Lieut. Herbert D. Ryman, M. C., U. S. A.
Died August 18, 1918.

THE
MILITARY SURGEON

VOL. XLIV JUNE, 1919 NUMBER 6

ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

MOBILE DEGASSING STATIONS

BY COLONEL H. L. GILCHRIST, M. C., U. S. A.

Medical Director, Chemical Service, A. E. F.

(With five illustrations)

THE IMPORTANCE of early bathing in connection with the treatment of men exposed to the fumes of mustard gas was recognized at the beginning of mustard-gas warfare, but the scarcity of water in many of the areas occupied by our troops, together with the shifting of positions from one place to another, rendered it difficult to administer this form of treatment.

As time progressed, the casualty list resulting from this form of warfare increased to alarming figures; as a result it became evident that drastic measures of some kind were necessary to counteract the ravages produced by it. Early bathing seemed to be the only solution, the important question being, How could it be done?

After a careful survey of conditions existing along the front areas occupied by our troops and studying the subject from all sides, it was decided that, with proper facilities, hot baths could be administered at the very front. It was recognized, however, that many difficulties would have to be met and overcome. To successfully perform the work, some sort of a mobile bathing plant, prepared to move at a moment's notice, complete in itself, with tank capacity for carrying ample water supply, pumps for filling the tank from streams, wells, etc., and provisions for heating the water and administering showers, would have to be devised. It was also realized that provisions for issuing clean clothing would have to be made.

To meet the above requirements, the mobile degassing station, such as herein described, was devised by the Medical Director of the Chemical Warfare Service and its construction authorized by the General Staff A. E. F., 1918.

The first mobile degassing station built was, with a few minor

changes, practically the same as those of subsequent construction. It was completed and demonstrated before representatives of the A. E. F. and the French, British and Italian armies on the parade grounds at Tours, France, early in July, 1918. At this demonstration the degassing station was erected in seventeen minutes from the time the apparatus arrived on the grounds. The entire plant was then demobilized and packed on the trucks ready for movement in nine minutes.

A second demonstration was made in which the shower baths alone were erected without tent or cover, two minutes being required for this procedure.

A later demonstration of the mobile degassing station took place at the Invalides, Paris, July 15, 1918, for the benefit of the representatives of the French, British and Italian armies. This demonstration, like the former ones, was entirely satisfactory and showed clearly the far-reaching results which could be derived from its use.

At the request of the British Government, the degassing station was assigned to the Fourth British Army where it was tried out successfully along the western front and under actual field conditions.

As a result of these demonstrations, degassing stations were adopted by our Government as part of our field equipment and placed on the tables of organization; 160 to be constructed and mobilized at once, the plan being to have two stations with each division.

This being a new unit of organization and requiring specially trained men for its operation, a school of instruction was established near Vouvray, France, where a large number of selected men from the A. E. F. having knowledge of motors and mechanical construction were ordered for a course of special instruction pertaining to the duties connected with these degassing stations.

DESCRIPTION OF MOBILE DEGASSING STATIONS

The degassing station, as adopted, consists of the following: (*a*) One motorized bathing truck, (*b*) one 3-ton truck of standard make for transporting clothing and equipment, (*c*) one motorcycle with side-car attachment for the commanding officer, (*d*) one 50-foot ward tent with uprights and pins for furnishing cover.

The mobile bathing truck (see Fig. 1), is equipped with a 1,200-gallon tank, rotary pump attachment for filling the same, and device for heating the water and generating steam.

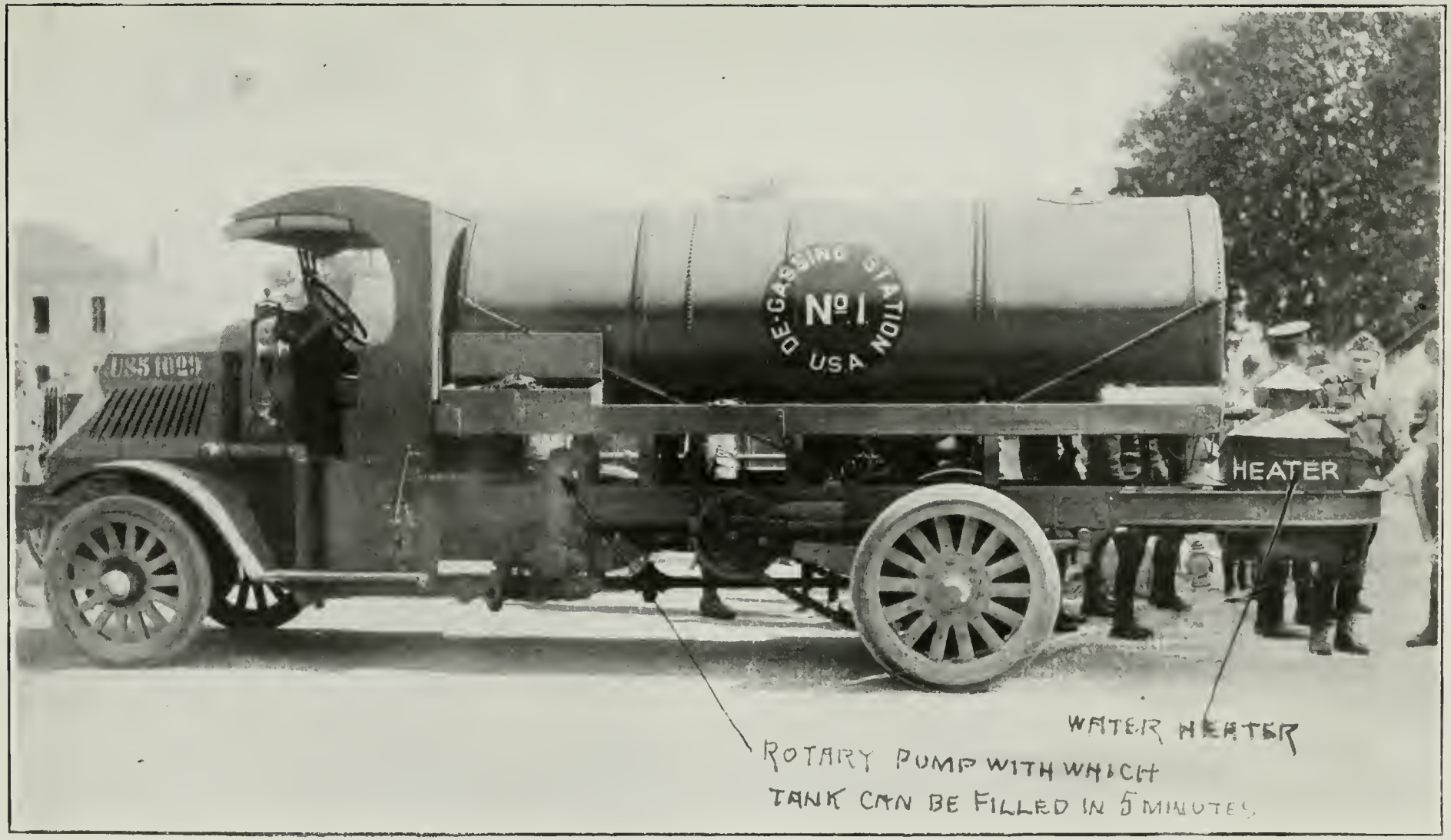


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Fig. 1.—Bathing Truck—With Accessories.

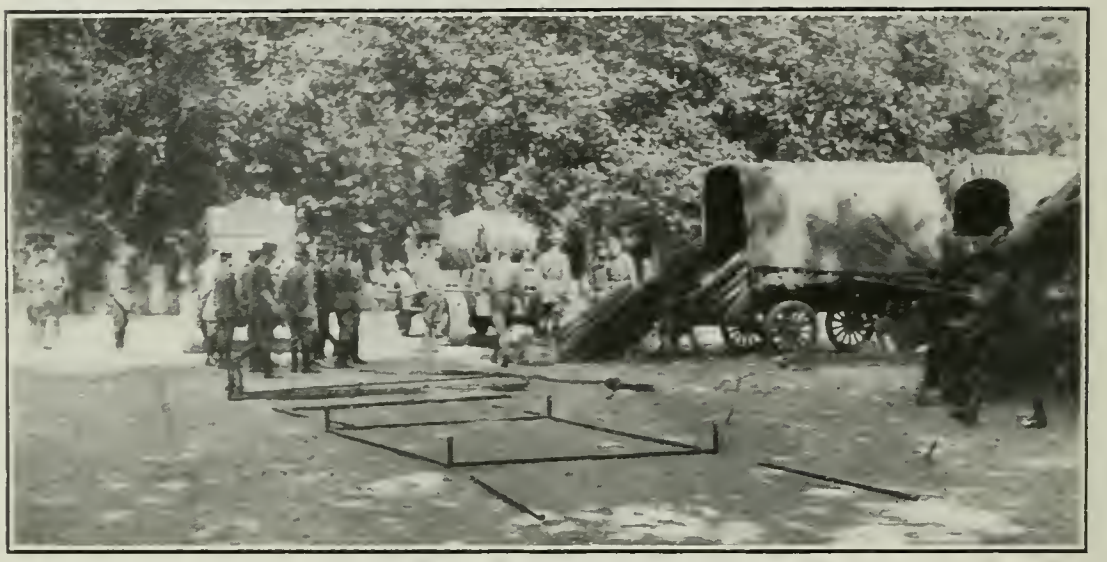

Fig 2.—Erecting Station

Fig. 3.—Station Erected and Undergoing Inspection.

Fig. 4.—Showers in Operation.

Fig. 5.—The Bathing Truck Being Inspected by Allied Representatives.

The bathing device consists of 24 shower-heads, each capable of ejecting four quarts of water per minute. They are attached to 1½-inch tubing and arranged in three independent section frames. Each section frame is 10 feet long and 30 inches wide, with independent valves. The sections being connected together by means of 2-inch tubing, 10 feet long, and to this is attached the hose leading from the boiler. The showers are supported upon a portable iron upright made of 2-inch tubing with sliding joints and, when erected, stand 7 feet 6 inches above the ground.

All the above equipment is carried on the bathing truck, thus rendering it an independent bathing unit in itself.

The equipment for the station, carried on a 3-ton truck, consists of the following: One ambulance guidon on lance staff, 1 flag (blue), 4 axe-heads, 6 axe-helves, 4 spades, 6 lanterns (two with blue globes), 3 pick axes, 4 litters, with slings, 1 hospital ward tent, 1 portable shower apparatus with 24 shower heads, 2 Vermorel sprayers, 2 barrels of lime, 4 small oxygen tanks, 4 Haldayne masks, 1 bag, water, sterilizing; 4 cans, g. i.; 1 box soap, 1 ounce cakes; bicarbonate of soda.

CLOTHING TO BE CARRIED WITH DEGASSING STATION

The transporting of clothing with each degassing station was found to be a serious problem and one presenting many inherent difficulties, due to the fact that thirty different sizes of clothing were on the supply tables; that a small space was available for the handling of the clothing, and that a limited amount of time would be available for its issue.

After a careful study of the records in the clothing department of the Quartermaster Corps it was found that the great mass of clothing worn by our troops was confined to a few sizes which could be consolidated into four issue sizes. It was also realized that clothing could not be issued in separate articles and that the same would have to be assembled into units of issue. As a result, all clothing was arranged in sizes as follows: For soldiers 62 to 66 inches, size 1; 66 to 68 inches, size 2; 68 to 70 inches, size 3; 70 to 72 inches, size 4. A few extra sizes were also carried for emergency. The unit equipment for each man consisted of one suit of underclothing, flannel shirt, breeches and blouse, all being assembled and securely fastened in a single kit, ten of which were packed in canvas bags with the size plainly marked on the outside. When applying for clothing the men would give their height, and

a kit consisting of unit equipment would be handed them. This system proved very satisfactory.

AMOUNT OF CLOTHING CARRIED WITH EACH STATION

The following amount of clothing in gas-proof bags, was carried with each station: Five hundred blouses, assorted sizes; 500 breeches, assorted sizes; 500 flannel shirts, assorted sizes; 500 undershirts, assorted sizes; 500 underdrawers, assorted sizes; 500 pairs puttees (woolen leggings); 500 hand towels.

Operating Department.—With the degassing stations 24 men can be bathed in one minute and a half, and if water supply is at hand there is no limit to the number of men that can be bathed. If no water is available in the vicinity 700 men can be bathed with that transported on the bathing truck.

Organization and Distribution of Personnel of Degassing Stations.—One Captain or 1st Lieutenant, Sanitary Corps—general supervision, reports, records and returns; 1 Sergeant, 1st Class, Medical Department—in general charge of records and clothing; 1 Sergeant, Medical Department—in charge of bathing section; 1 Sergeant, Medical Department, chief chauffeur and mechanic; 7 Privates, 1st Class, or privates, Medical Department; 1 Private, 1st Class, to be chauffeur.

Departments of the Degassing Stations.—The degassing stations are divided into sections as follows:

(*a*) Reception department, for the receiving of all men to be bathed.

(*b*) Bathing and irrigation department.

(*c*) Clothing and evacuation department.

When the station was operating, the following system was observed. All men reporting to the station were carefully scrutinized for signs of gas poisoning. Those presenting gas sympoms were treated immediately and evacuated, the others divided into sections or squads of 24 men each for the purpose of systematizing the bathing. The members of these sections then stacked arms, removed all loose equipment, and laid it on the ground in front of them. They then proceeded to the lime box, where their hands were disinfected with dry lime, the same method being used for disinfecting their shoes. Blouses were then removed and disposed of according to directions, following which they proceeded to the reception department in tent and took position in front of their designated numbers on the canvas where they were instructed in

the manner of taking baths. Prior to entering the tent, helmets were dipped in a tank of lime water for the purpose of degassing.

Method Employed in Disrobing.—In disrobing, the following system was adhered to:

(*a*) Helmets were placed on the numbered canvas sections in front of the men and used as receptacles for holding valuables, small trinkets, etc.

(*b*) Flannel shirts were then removed and disposed of according to directions.

(*c*) Shoes and socks were then removed and placed with the other retained equipment.

(*d*) The underclothing was then removed and placed in the proper receptacles.

When men were disrobing they were not permitted to sit down, but remained standing, thus avoiding all possibility of infesting the places which were to be used later when rearranging their clothing.

After all members of the squad were disrobed and their clothing and equipment properly disposed of, they marched in column of files to the bathing department, where they took their places under the shower-heads. Before the showers were turned on, the men sprayed themselves with liquid soap. At a given time the showers were turned on, allowing 15 seconds for wetting the bodies. When time was a factor, three-fourths of a minute was allowed for scrubbing the body, following which the showers were again turned on for 30 seconds. After the bath, clean towels were issued and, after being used, they were placed in proper receptacles. Passing from the showers, the men's eyes, noses and throats were sprayed with a solution of bicarbonate of soda, 5 per cent strength. They then proceeded to the kit department, where they received clothing kits, returning to their places and quickly readjusting their clothing.

While stripped the men were again examined by the commanding officer, and, if possible, by medical officers, for signs of gas poisoning. Those exhibiting genuine signs were immediately evacuated to the hospital. After the men redressed, they returned to their commands.

In order to avoid delays in waiting, sections or squads of 24 men were ready to proceed to the baths as soon as they were vacated.

The degassing stations were designated during the daytime by

the displaying of a large blue flag, at night by a blue lantern.

Possibilities of the Degassing Stations.—The possibilities of the degassing stations are unlimited; their particular advantages are:

(*a*) Being mobile, they can be taken to the men instead of compelling the men to march to a fixed bathing point.

(*b*) Hot baths can be given to men when most needed.

(*c*) They are so arranged that bathing places can be erected in a few minutes in abandoned houses or in the open.

(*d*) Their use is not restricted to degassing men subjected to the fumes of mustard-gas poisoning, but they can be used for bathing men infested with lice and vermin and the bathing of medical and surgical casualties at the front.

Control of Degassing Stations.—The degassing stations were under the control of the Medical Department, and those assigned to divisions were placed under the direction of the division surgeons, who dispatched them to places where most needed.

While these stations were not completed in time to be used to any great advantage in the front areas, it is believed, had the war continued, the casualty list resulting from mustard-gas warfare would have been greatly decreased by their use.

Since the signing of the armistice the stations, together with the entire Medical Department personnel operating them, have been assigned to the Quartermaster Corps for the purpose of delousing and bathing of the forces of the A. E. F., where they are now performing most efficient services, some of the stations visiting three and four areas daily and delousing thousands of men.

THE AMERICAN RED CROSS WITH THE A. E. F.

By Brigadier General FRANCIS A. WINTER, M. C., U. S. A.

Chief Surgeon, Line of Communications, A. E. F.

SOME of the older officers of the Army had a chance to see the Red Cross do war work in Cuba, during the Spanish War, and just as that entire expedition was in the "day of small things," so the Red Cross endeavor was no great affair. As a matter of fact it seems quite remarkable, looking back to the history of twenty years ago, that the Red Cross never followed the Army into the Philippines during the insurrection. The opinion may be hazarded that such a failure to follow up the Army wherever it might go at the present date is quite unthinkable, because the society has become both a fixture and a necessary adjuvant.

The experience of the midsummer venture in Cuba in 1898 focalized some good brain power on the Red Cross problem during the years from 1898 to 1917, and the end result of the quiet forces which exerted a sure, continual pressure on the question as to what the great auxiliary should do in war time, became manifest when we got into the muddle in April, 1917. Men like Mr. William H. Taft and Mr. R. W. DeForrest, working with Miss Mabel Boardman, gave through these years a steady impetus to Red Cross preparation and pushed on the comparatively small activity which was to extend into the great and elaborate endeavor of the war-time work. The results achieved by Mr. Henry P. Davison and his associates followed, surely and precisely, in the really wonderful amplification which was brought about.

Of course the society did a multifarious lot of things before we got our dogs unleashed in the war game, but if it had done only the one piece of good, preparatory work which covered the organization of the American base hospital units, it would have earned its keep.

What were these units and how were they brought together and welded into working outfits, ready to go out in an emergency? The quite usual history of a unit is interesting. The army representative with the Red Cross visited a university or other medical teaching unit, or hospital, and submitted a proposal that the institution get together a personnel of physicians, surgeons, orderlies and nurses to care for 500 beds. This personnel was to be organized as a Red

Cross agency, to be transferred to the Army and go into active military service as a general hospital when called upon to do so in war time.

A general hospital meant a place where a patient could get his fractured thigh bone skillfully repaired, his inflamed appendix removed *secundum artem,* or a piece of steel recovered from the deep-lying precincts of his eye or his brain. All the vagaries of human illness were to be attended to.

To function along these lines, the units must have had a widely specialized and proficient personnel, and surely they got it. The medical men were the best specialists and general professional workers in America, and the splendid nurses and enlisted men were carefully selected, just because the time was ample to weigh the qualifications of the material which came up for enrollment and to cull the applicants. Months before war was declared, the Red Cross had forty of these units assembled, ready to be turned over to the Army, on call, with the equipment provided, in most part, and a wholesome enthusiasm abroad in the personnel. It makes the medical men throughout the country a bit proud when they know that six of these fine organizations, staffed by their guild and organized by the Red Cross, were the pioneer units of the U. S. Army to get on the soil of France, as America's contribution. These six units reached France in May, 1918, for service with the British Expeditionary Forces, and when they were slated to go abroad ship in New York, the personal baggage was ready and the working equipment in shape for transportation.

Others, of course, followed in the wake of these and, whenever a division of troops arrived in France, the attendant and appropriate base hospital arrived also, and there never was a time in the history of our Expeditionary Forces across there that the wounded or sick soldier in a base hospital did not have a good bed, a good nurse, and a first-class doctor to look after his incapacities.

There are some interesting sidelights on the personnel of these units, and some of them are worth a rehearsal. For instance, it was in no way suggestive of the sporting spirit to see a captain in the Medical Corps, albeit he carried a gray Van Dyke beard, doing duty as Officer of the Day aboard ship; but it did impress the line colonel in command of the troops on the ship, and whose adjutant had detailed the O. D., to find that his selection had fallen to the leading otologist in one of our great cities, who in civil life was the master of several highly technical pursuits, including diseased mastoids,

and who derived some hundred thousand dollars a year from his practice—and the funny part of the story lies in the fact that the ear man made a corking good O. D! It was probably the real sporting spirit underlying his great professional acumen which returned him to his home city as a colonel in the Medical Corps, eighteen months after he went abroad.

In one base hospital the son of a Philadelphia multimillionaire carried off the job of a "buck" private without any heartache that one could see and there wasn't a more thorough live wire on the soldier job in the American Expeditionary Forces. The fact that the youngster had presented a high-powered automobile to his unit as his contribution to the general preparedness did not by any means divorce his feet from the "Gallic bog" and he carried his mud like a man and tidied it off like the real sport he was.

If America thinks her women do not carry a duty consecration which knows no balk, in the worst of forays and alarms, let her give a little bit of attention to those splendid spirits who withstood their portion of these beastly affairs, as army nurses in our advanced hospitals. They came to the front without any falter and they sought the point of greatest danger, with the single idea of business. The environment of a New York hospital was no necessity to these women, and their work went forward with just as great *elan* up in the mud of the Champaigne as it had ever shown in their parent hospital.

Incidentally it is pleasant to know that Miss McDonald, of the New York Presbyterian Hospital (Base Hospital No. 2, A. E. F.), has been awarded the Distinguished Service Cross as some salve to the loss of one of her eyes, sustained by shell fire, and incurred as she stood at an operating table "exhibiting extraordinary heroism." These gentle spirits, so very militant when it was necessary to take on that quality, came to the Army in large measure through the channel of the Red Cross Nursing Service, and many of them were enrolled long before we went to war.

I recall very well the complex of fears that I had when I went to France to those parlous times, which were reasonably to be expected as the sure portion of a chief surgeon of the lines of communication, behind an enormous army. Among the array of lions which loomed big in the path was the coterie of great big business men, translated, as Red Cross agents, into the job of helping to care for the sick and wounded men of a great army, under the control of the military authorities. Their work with the civil pop-

ulation in America and the European countries might very readily be taken for granted, but the liaison with an army in the field was an untried problem and nobody knew how the thing was going to result. Of zeal there was doubtless a plenty, but how to befittingly control the manifestations of that zeal, when it got its full head, might easily furnish some basis for thought, in casting about for methods to make the cogs fit. A modern American business man, successful in his endeavors and accustomed to "putting it over" in his daily grind, without any higher authority in the game, was no certified item of easy control and no fixed quantity for coöperation, under the limitations set by military canons and prescript.

Yet there seemed to be nothing in the real essence of the situation which could not be met, provided a measure of tact and good-will, additional to enthusiasm, could be assured on the side of the Army, on the one hand, and the side of the "Captains of Industry," on the other. While an army officer may obviously hesitate to put these necessary attributes to the credit of his side of the convention, he may with entire propriety say that the Red Cross control in France had them, in plenty and to spare. The men at the top sensed, with keen minds, the wherefore of their being in the transaction, and to their innate quality of being able to contract their range and stretch their limitations is due the fact that the whole affair was carried over without any of that friction and contention which one might be pardoned for having feared. There was no written prescript which could have possibly foreseen and provided for the thousand and one situations which arose from day to day, and which, in the hands of men of contracted vision and intemperate zeal, would have stalled the machine and made bickering possible.

Maybe the case for the Army in the question of its endowment with the necessary tact and good-will is proved by the foregoing implication that there was not any internecine strife in our joint house. I do not know how far we took the Red Cross men into our camp, but I do know that they took us into theirs, and they did it beautifully, gracefully, helpfully, and we were given of their bread and salt in plenty. If they bossed us, we did not know it, nor did we consciously boss them, the whole trend being rather to a smooth team work, which made for one great, fine prosperity.

There were a lot of big, broad men at the Washington end of the line, and no one could find better types of that same quality than found in the office of the Red Cross in the Place Concorde in Paris.

Maj. Grayson Murphy was the first kindly lion with whom we had to deal, and it was a toss-up whether one got more pleasure out of contact with him than he did when he was passed on to the office of Maj. James Perkins. Both of these gentlemen had the heart and the breadth of view necessary to the situation. They were both New York bankers and their outstanding impulse was service. One also found pleasure in hunting for assistance from the Chief Surgeon of the Red Cross, Major (later Colonel) Alexander Lambert, Medical Corps, who came from the bedside of New York patients to handle this part of the Red Cross job.

Just here it seems fitting to say that if the Red Cross made preëminently good in France—and certainly it did just that—there is one outstanding reason for this success, and that reason lies in the excellence of the personnel which went across to handle its work. No amount of money, and no range of chance to spend it, could alone bring real achievement, and to the intelligence shown by the central authorities in putting the work into the hands of real executives the success of the undertaking must, in the last analysis, be laid. The men at Place Concorde weighed any project put up to them and, while nothing was impossible, they lent valuable counsel when ways, means, and expediency were under consideration. If it looked possible to do a thing, it was done, and by the shortest possible route.

By no means were the efficients of the organization confined to the central offices in France. All along the lines one met intelligent, wide-awake representatives, who were ready to do business at any hour of the day or night. The situation in England, for instance, was a very trying one during the spring of 1918, when enormous numbers of our men were suddenly debarked from transports at Liverpool and hurried through England to France. They always carried a large distribution of disease with them, and there was a steady stream of poor chaps coming across the channel from France into England, bearing the ineffaceable marks, which they had gotten on the lines in Flanders while serving with the British. It was my good fortune when serving as chief surgeon in England to meet Col. William Endicott, of Boston, who was the representative of the Red Cross there, and during the period of stress, when it became necessary to establish American hospitals and do it at once for the care of our sick and wounded, the steady, helpful and unfailing coöperation of the Red Cross, under his direction, meant a great deal more than can be here adequately set down. The American

soldier whose destiny had thrown him into England knew it, and his smile of content showed that he knew it. To appreciate the full measure of this timely aid, one must have been intimately mixed up with the proposition as it progressed from day to day, and it is not too much to say that the Army had the very best of helpers at its constant command in the office presided over by Colonel Endicott.

I remember that at one time I found a need of cash funds for the purchase of delicacies for the men in the hospitals, and my balance was low. I saw one way to get it immediately, though, of course, I should ultimately have been able to obtain the money from the hospital fund of the Army. However, the money was wanted just as the Texas man wants his gun, and I really think that had I asked Colonel Endicott for a hundred thousand dollars, explaining my need to him, he would quite as readily have turned that amount over to me as he did when he gave me a check for five thousand dollars, after I stated that figure to be the extent of my proposed inroad. I note this as an instance of the ready and timely response which came on a presentation of our needs; it is but one small item, taken from the many instances which occur in my diaries.

It did not take many days of this sort of contact to dispel any fears that the business men in the Red Cross entourage were going to be obstinate and recalcitrant, so the offices of the Chief Surgeon of the American Expeditionary Forces and that of the great ancillary service got a fine concurrence at the start, which they never lost during the great days which followed. This relationship was always helped and fostered by the wise supervision and broad view of the Commander-in-Chief, and General Pershing never had a keener interest, I believe, than that presented to him in the matter of caring for the men, who were badly dislocated, so far as home was concerned, when sickness or injury blighted their spirit.

Specifications of how the Red Cross work, auxiliary to the work of the Army, was carried forth, would transcend very largely the limitations of this narrative, but most people who have made contributions to a cause are interested in knowing some sample instances of how their helpful donations were spent for the soldier man who was plodding his weary way through the mud of France.

In connection with its pre-war work, the Red Cross had gotten together big stocks of stuff, of infinite variety, into warehouses in France before the American Expeditionary Forces came on the scene, and these stocks were perfectly priceless to us, in the early

days and later, when our hazardous shipments failed to arrive. It is easy to recall, for instance, the time when the expected and indispensable shipment of ether for our hospitals failed to show up because of the submarine toll, and everybody felt so much easier when 20,000 pounds were shipped from a Red Cross warehouse in Paris to our depot at Cosne, thence to be distributed as we might elect. Pajamas were lacking at one time, and it was very consolatory to find, on a visit to our supply depots, that the call on the Red Cross had been responded to in so very substantial a fashion that 75,000 pairs of outing flannel garments loomed up in the warehouse.

A board of clever American surgeons, under the direction of General Bradley, Chief Surgeon, American Expeditionary Forces, compiled a manual of splints, demonstrated by our Allies and our own people to be the proper agencies in the surgical treatment of gunshot and other fractures. The Red Cross published this book and did more. The descriptive matter was not of much value without the actual apparatus, so a Red Cross splint factory grew up in Paris, where thousands of the most modern adaptations for patching up maimed soldiers, were produced and shipped out.

If one thinks it a matter of mere flashing the Aladdin lamp of money to get a splint factory going in a country depleted by three years of war of everything in the metal line, let him try it and he will ungrudgingly take off his hat to the people who effectuated this enterprise.

Motor transport was often a mighty scarce article in the days of the American Expeditionary Forces, especially in the early times when the army had not struck its automobile stride. Many a gallon of gasoline did its little bit for our cause, in machines which the "drag" of the Red Cross pulled out of the blue sky for us. Just how the Place Concorde dug up motor transport is somewhat of a mystery, but it showed up when the need was often very great. Many an American consultant, whose consulting fee to the city patient at home was no negligible matter, got to serious cases on time, and, at one of our hospitals in some little remote French town, lifted the weight off the heart of the sick or wounded youngster who needed, and knew he was getting, the best medical help in the world. As often as not we pushed on this help to him in one of the "mystery cars" of the Red Cross. I have heard the statement made that these Lady Bountiful fellows got their cars by virtue of their great wealth, but the transport was priceless and it needed more than mere

money, of which there was pretty generally a surfeit, to walk away with an actual motor car, fit for service.

Well up toward the front at Neufchateau, for instance, the Red Cross early provided itself with warehouses, which were well stocked with stuff to help us out, and when division surgeons—those with troops at the front—needed emergency supplies, because of delays on the over-congested railroads of France, for instance, they mostly had a generous uncle in the local Red Cross man. One over-provident division surgeon had to leave behind him many truck loads of first-class stuff, contributing greatly to the comfort of his sick people, when the order came for his outfit to move, and not a little of this stuff could be traced to the able-bodied Red Cross man who tended the sector of that division.

The Paris hospitals, which went under the general designation of "American Red Cross Military Hospital No. ——" were our early and unfailing friends in need. Primarily, we had the former "American Ambulance," which had been established as an hospital for French wounded and operated by an American staff in the autumn of 1914. The Red Cross took it over in August of 1917, the Army staffed it and operated it, and from 400 beds in 1917 it had grown to 1,500 in 1918, with a very wide range of general hospital service.

Then we got American Red Cross Military Hospital No. 2, which had been a private sanitarium and held about 200 beds, and finally No. 3, which was an officer's hospital of 75 beds and which was fitted, equipped and presented for our use by a very gracious and helpful lady, Mrs. Whitelaw Reid, through the Red Cross channel. These hospitals were largely sustained, especially in the beginning, by Red Cross funds and the matter was bountifully looked after.

What these three comfortable places in Paris meant to us in the early days is very well known to many officers and men who derived comfort from them, but they shone out wonderfully in the great offensives north of Paris in the summer of 1918 and supplied us with priceless space for our battered youngsters, who were evacuated through Paris.

In times of stress at the front, in France, the Red Cross lent a helping hand in the establishment of additional hospitals wherever their need was indicated and turned them over to us for operation.

One cannot imagine a prettier hospital plant than American Red Cross Military Hospital No. 4, at Mossley Hill, Liverpool. The Red Cross rented the land and built the hospital of 400 beds for our

use as a reception and debarkation point for sick. Thousands of men were cleared through it and it left a good taste in the mouth of any soldier who sojourned there. Again at Sarisbury Court, near Southampton, a fine plant of 1,500 beds, grouped about a superb old English manor house, was nearing completion when the dove of peace loomed on the scene. One may admire the courage and the vision which prompted Mr. Davison to purchase this estate for the sole purpose of helping the doughboy in trouble. It must be remembered that all the construction involved at these places was carried forth in a country where labor was nearly as scarce as alligator pears in Labrador, and everything was difficult.

I heard Sir Arthur Stanley, of the British Red Cross, make a very happy after-dinner talk in London, in which he sketched his fine knowledge of the workings of his own organization and made some interesting comparisons with that done by our society. Among other things he mentioned the fact that so greatly obligated were his people to the American Red Cross that they planned to erect, in the Royal Park at Richmond, a 500-bed hospital to be presented by their society to ours, for the use of the American Army. The hospital was well under way when the armistice was signed.

In this talk Sir Arthur compared the financial response of the two countries to their Red Cross societies and felicitated us Americans on the showing that, while Britain had subscribed $55,000,000, America, in the war for less than eighteen months, had contributed over $300,000,000 to her society.

This national generosity merited a careful and painstaking effort from those entrusted with the disbursement of the funds. I am no auditor and I do not pretend to know whether everything the Red Cross did was done wisely and well, but I do know that in practical everyday work, to help the needy soldier, the country got excellent effort out of the Red Cross. I saw it work at close range, and I am more thankful every day of my life that it was with us, and of us, in the trying times of the past two years. If I ever go out again as a chief surgeon of a line of communications or anything else, I shall "make medicine" with the Red Cross, early and often, and I shall do it in the full conviction that the Red Cross usurps nothing beyond the limits of practical advantage, and only strives to do its level best at all times.

A LECTURE ON FIELD HOSPITALS[1]

By Colonel BAILEY K. ASHFORD
Medical Corps, United States Army

Many of the reforms indicated for our Army were promptly made in time to contribute to the success achieved in the second battle of the Marne and the last operation of the Argonne-Meuse. The reforms were not only expressed at this school, but were the fruit of observations made by our medical officers all over the A. E. F.—B. K. A.

GENTLEMEN: That there is some uncertainty concerning the use of field hospitals in modern warfare is putting it mildly. There is no medical department unit about which so much question has been raised. The first thing you hear on reaching France is that everything in this war is different from what you had been taught it would be. When you mention the field hospital in the midst of a crowd of medical officers who have been here a few months a perfect chorus of contradictory advice, opinion and fixed ideas assails your ears. Hardly any two people agree on its proper use, no one agrees on what its equipment should be, and some believe it should be entirely abolished. A student officer came to me the other day and said: "I am completely at sea about my unit. We were carefully taught to bring our field hospital up to a certain definite standard for war service over here and when I get here I hear that it is all wrong, that field hospitals are now being immobilized as venereal labor camps, delousing parlors, bathing establishments, gas hospitals, rest stations, dressing stations, and stations for the treatment of itch—anything but for mobile surgical advanced hospitals for which they were originally intended. What is the truth and where can I go to see something of this war? I don't want to run a medical department junk shop."

Some of our best men in civil surgery say we should be prohibited from doing any surgery in field hospitals and it depends on the imagination of the speaker just how far he goes. Down at the base hospitals you hear men wisely expatiating on the ignorance and unfitness of the men who insist on doing surgery in field hospitals that are not equipped for it. They usually wind up by strafing everything in front of them and by declaring that there ought to be a general order forbidding that any surgery be attempted in such places. "Send them back to us," they exclaim in a grim and saw-like voice, "and we will take care of them"—but there's the question, to send them back. Now, as a matter of fact, there is no real difference between the ability of the men at the front and

[1]At Army Sanitary School, Army Schools, American Expeditionary Forces, France, July 1918.

the men at the big hospitals in the rear. The difference is that each sees only the world in which he lives and supplies the rest from a mixture of prejudice and lurid imagination or from garbled stories of atrocities and incapacity of individuals he has picked up—chiefly from the soldier. The field hospital people hear about this or get expurgated editions of these fiery speeches, tempered out of politeness for their ears, and imagine the rest. The result is that when one and the other get together the barometer falls rapidly.

Now in a case of this kind, gentlemen, it is necessary that you get some facts before you draw your conclusions. The trouble with many of our people is that we draw our conclusions from our fertile imaginations when we ought to draw them from the facts.

I am going to try to put before you today some facts as we have seen them in a year and a half of observation of British, French and American fronts from the North Sea to Alsace, in which we have talked with field hospital commanders and officers over and under them, as well as with all other medical officers from the humblest battalion surgeon to the Chief Surgeon of the Army. Nor have we been limited to talking with them. We have lived amid these scenes and have seen these organizations functioning. I am going to ask you to remember what you learned about field hospitals out of a book and from training camp, and their use in a war of movement. With all this, and then only, can we draw our conclusions.

In the first place war has changed, surgery has changed, everything has changed except the basic principles.

1. Our field hospital was equipped and its tactical employment defined when 90 per cent of wounded were clean bullet wounds and troops changed their position every day. Up to very recently this war has been a war of siege in trenches and 85 per cent of wounds have been due to high explosive shells, or grenades, and all were infected.

2. In addition to this the range of fire has been greatly increased, and especially of indirect fire, in which the reverse slope of a hill ceases to become a safe spot.

3. Visibility has been secured by means of aeroplanes and balloons and used against the enemy.

4. The Cross of Geneva has been ruthlessly violated, and even well back out of gun range our hospitals have been attacked by enemy avions.

5. Military surgery, too, has changed. Once an aseptic dressing and rest sufficed to reclaim a large proportion of our wounded. Now all shell wounds are infected and must be operated upon as soon as possible—certainly within twelve hours if the ideal is to be approached, although

operation in slightly wounded may be delayed twenty-four to thirty-six hours.

6. Radiology must be done at the front nowadays. No operation involving a lodged missile should be undertaken without it.

7. Antiseptics have largely given place to surgical sterilization—not by removing all bacteria but by removing the chief source, the clothing carried in by the missile, and by cutting away the dead tissue, the food for bacteria, without which they will be overcome by the living cells in which they fall. Such operations cannot be complete under stress of great activity at the front, but they must be begun, the wound well opened, and the missile and the clothing enveloping it removed.

8. Shock is far better understood because its predisposing causes are better understood. It is not merely hemorrhage, concussion, and pain that precipitate shock but, above all, cold and exhaustion. Moreover, the lack of rest and comfort plus the depressing influences that surround him have prepared the soldier for shock by reducing resistance—have removed his margin of safety against shock.

9. The fatal hemorrhages of other wars can be often averted by early surgical intervention and blood transfusion.

10. Only two to four of the fifty-two weeks of the year are ordinarily lived under combat conditions in trench warfare. The remainder of the time is spent in intrenched positions.

11. Rapid transportation to the first hospital capable of making men comfortable and providing modern surgical equipment for definition, operation and hospitalization has taken the place of incomplete makeshift dressing stations and many stops on the way to the final destination of the wounded soldier. The surgery of war has largely moved to the evacuation hospital just in the rear of the troops engaged.

12. In an attack we should prepare for at least 25 per cent of casualties of which some will be unable to reach an evacuation hospital direct, which is the ideal, on account of distance, delay in transportation, etc., without seriously aggravating their condition or causing their death. It is for these latter that the field hospital is absolutely necessary, particularly in a war of movement by which the evacuation hospital is left farther and farther in the rear. With a nearby evacuation hospital over a good road, direct transport, even of seriously wounded, is preferred, but even then some must be held for operation or on account of shock at a field hospital.

The conclusions to be drawn from these facts are:

1. Field hospitals must, at least in a war of movement, operate on some seriously wounded, notably chest and abdominal cases, as well as transfuse, deshock, and in certain cases amputate.

2. Their equipment must be brought up to modern surgical requirements, and their personnel must be reinforced by operating teams from the rear.

3. They must, *during inactivity* be immobilized and made comfortable hospital cantonments, provided with double walled tents, good beds, and all of the dependencies necessary to supply good food, warmth, light, comfort, and amusement for the soldier.

4. They must be prepared at all times to advance or retreat with the command, carrying with them a definite part of their equipment which can be made portable and which should be selected in advance, to permit them to carry on at another point under battle conditions. That is to say, they must be able to rapidly mobilize for movement, taking with them the combat essentials of a field hospital.

Let us see how these requirements are being actually met in this war.

First in the *British* lines:

I have made a few brief notes from what is contained in that mass of literature prepared for you by this school, because I have seen it and may be able to tell you things not written there. In the first place General Thompson, Chief Surgeon of the 1st British Army, gave us a little sketch of the British field hospital. He said that the British field hospital, known as the field ambulance, is composed of two unequal divisions, a bearer division and a tent division, and that each one of these is divided into three equal parts, or sections. A section of the bearer division had 42 men and a section of a tent division had 23 men. Multiply these figures by 3 and you get the full personnel of the tent division and the bearer division. The total was 10 medical officers and 182 men, plus 49 Army Service Corps men—about 250 men, and you find that is what our field hospital plus ambulance company amounts to. He says in the old days they used to have a field hospital and ambulance company. They called them "field hospital" and "bearer company." This was in the South African War; but they found that there were difficulties in harmonizing the work of both these organizations under separate administration and, for the purpose of securing more simplicity and greater efficiency, they put a lieutenant colonel over both of them and made a "field ambulance" out of it.

The object of the British field ambulance is to furnish a mobile operating hospital to accompany troops in the field wherever they go, and they are so equipped that they can go wherever a gun can go. That's the object of the British, the object of the French, the object of the American. There are three horse-drawn and seven motor ambulances for the cantonment work. They use the motor ambulances to connect with the A. D. S. (advance dressing station); that is an outpost

of the field ambulance and corresponds to our ambulance dressing station. The headquarters of the field ambulance is the M. D. S. (main dressing station). The general said that the horse-drawn ambulances were useful when there was lots of mud, because they could tie long ropes on the back of the ambulances and tired soldiers could hold on to them and help themselves along into camp on a long march in campaign; that they were very useful also for short hauls and to go where motors could not. He said the main dressing station—that is to say, our field hospital—was not a desirable institution at all where it was possible to get men back promptly to a C. C. S. (casualty clearing station), and, gentlemen, that is the spirit of the entire British Army. What every man feels down in the bottom of his heart is that they don't want to send their wounded to the M. D. S., but prefer to get them direct to the C. C. S. That means that the British have never made of their field hospital everything they wanted to make of it, the thing we are failing to make of it, what we want to make of it. But when the A. D. S. is small and can't act as a good station, or the C. C. S. is very far to the rear, over a bad road, or one liable to be blocked, then the main dressing station, or field hospital, becomes important, and why? Because it becomes an evacuation hospital. That's why, and that's what the French have done. They have made an evacuation hospital of it without calling it that. General Thompson emphasized the thought that all we call hospitals ought to be really hospitals in the modern sense of the war and not mere stopping places to delay a man getting in.

Now Colonel Jones, one of General Thompson's division surgeons, added a few things to that. He got to talking about the transportation and said that in addition to their ambulances—the three horse-drawn and seven motorized—they have six general service wagons, just like our mule-drawn wagons, only with heavy draft animals. They also have what we never had, four supply limbers; they even look like artillery caissons; in fact they are, except that the caisson box takes dressings, etc. They have them in order to carry supplies from the main dressing station up to the advance dressing station, that is, from your field hospitals to your ambulance dressing stations. They also supply the R. A. P.—regimental aid posts, as they are called; they are not regimental posts, they are battalion posts—they supply these and are very well suited to that purpose. They are very light and quick and can go over any ground at all. He also told us that the evacuation in the rear of the field hospital—from the field hospital to the casualty clearing station (our evacuation hospital)—was carried on by the motor ambulance convoy. The motor ambulance convoy is a big company of motor vehicles—finest ambulances in the world;

nothing like them that I have seen. There are fifty in a company and they distribute them for withdrawing wounded from the main dressing station to the casualty clearing station. They are an army unit and they are used as needed all over the army area. The French in their service call them S. S. A.—Service Sanitaire Ambulance, I think is the real name for it. The point is that the transportation of the field ambulance doesn't transport any further back than the M. D. S.; from there back to the casualty clearing station is by motor convoy. Now I asked another officer, an old field hospital commander, to tell me frankly what he thought ought to be changed in their field ambulance, and I was very much surprised to find that he considered it at least debatable that a field hospital is an anacronism. He believes a division should have augmented battalion personnel and augmented motor transportation companies, as well as a company of brigade stretcher-bearers. He believes in taking away the tent division of the field ambulance completely, that is to say, taking away that portion of it used for hospitalization, our field hospital, leaving only the ambulance company part of the field ambulance; he believes in taking away the ambulance transportation entirely and would thus create a company of bearers. Thus the ambulance service would run by means of the motor company all the way from the advance dressing station back. There are a great many things that would seem to indicate this is the proper thing to do in trench warfare, but in a war of movement I believe it would be a mistake.

Let us review some of the field ambulances that we saw. I want to say that I have never seen, either in the British or the French Army, a mobile field hospital.[2] They are all immobilized. The reason why we didn't see them mobilized was because then they were having a war of siege, trench warfare. Whenever armies come to a standstill and sit down in front of each other, these field ambulances naturally become immobilized. Now, it is well for us to remember always that it is force of circumstances and not any plan or army regulation that determines what should be done in a crisis. Men respond to necessity along the lines of least resistance. This force of circumstances determines the plan.

I was anxious to see what the British were actually doing with their field ambulances. Their field ambulances were the only divisional medical service that they had. What happened was that about 8 kilometers from the front they would establish the headquarters of their field ambulance, their M. D. S. They would establish in buildings and they generally have a very keen eye to getting a good place. The British medical officer is a very well-accredited man in his army, and it is, for-

[2] I saw many, however, since the date of this lecture, when the war of position became a war of movement.

tunately, an axiom in the British army that one of the best places shall be given to the field ambulance. Consequently all the places selected for field hospitals were nice places, even pretty places.

Now here comes the spirit of the British. We have got to talk very plainly here today; there is no use trying to gloss over facts, and we are talking about facts. There are a number of men—I hope it is small—who think that only the things that are really necessary shall be supplied; that all things concerning the men's esthetic comfort be scrapped. I am not saying how many believe this, but with too many men it is true. They only think of "the practical things of life." A man must have so many calories. Here are canned beans, canned tomatoes, canned potatoes. There you are. Go out and sit on a manure pile and eat it; the food will do you just as much good there as at a table. You have three blankets; what more do you want? You have something to lie on—a bed sack of straw. That's the only way to make a soldier of you—give you the necessaries and scrap all these fancy things. That idea is in the back of the head of the great many I have talked to, but it is not the spirit of the British army nor does it represent the spirit of the majority in our own. In the British army the first consideration is the soldier's comfort. A hospital is a place where he will be made comfortable. They take into consideration not only his physical comfort but his esthetic comfort, and that's a strange thing to find in the apparently intensely practical Briton as we have seen him from our side. The British officer will do anything to make his soldiers comfortable in their mind and in their body —and in their soul, if he can. He provides them with chaplains and attaches these to the field ambulance or C. C. S.; he provides them with all kinds of amusements—games, all kinds of recreation. He is very methodical about it. He tries to keep people in good humor—goes to great lengths to do it. He insists on men being clean and takes the ground that good hygiene is nothing more nor less than good habits; that no man can think well if he is dirty or slouchy; that his pride as a soldier decreases the moment he gets on a dirty uniform. And they are right—absolutely, unqualifiedly right! Therefore you always find cobbler shops, tailor shops, etc., in all of these hospitals. Everybody shaves every day and everybody bathes just as often as he can and wears smart clothes. They generally get a chateau, perhaps along the side of a canal, in a wooded park, and they try to pick out what they call a restful place. I have seen some of these "restful places." In fact, one officer told me he always picked out a place for a field hospital where men would sort of forget the war, and then he went on to say that the night before they had been bombed and a lot of men killed in one of his wards. That's the spirit of the British army: the comfort of the men is sought and they go to great lengths to get it.

But no people are more practical about things than the French. Some of their field hospitals are the best I have ever seen. Each, in his own way, has made a mighty fine place for his men when they are wounded or sick. All the same, the racial characteristics have come out very strongly in sickness and injury. It is very remarkable to step from one to another, from British to French, and see the racial characteristics stand right out, in a hospital more clearly than in any place I know.

Now let's take a British A. D. S. that I remember having seen in the first session of this School. It was in a chateau. There was a dressing and operating room—clean, warm, well painted, fully equipped with everything they needed for operation. You had to ask, "Is this an evacuation hospital or a field hospital?" You wouldn't know if you weren't told. It was immobile and was an up-to-date hospital and could meet modern surgical requirements. They had bucket latrines and incinerators. They always have a bucket latrine and always have an incinerator, and there is never any trouble about running them. I want to say, just incidentally, that the latrines are often near their kitchens, and they put them there on purpose. They say, "Keep your latrine clean and there is no danger at all." It makes them keep them clean. The incinerator serves to burn solid garbage as well as to burn feces. There is a man always on duty at that place. He is charged with the duty of keeping the incinerator going, and there is one by day and one by night. He is not put there as punishment but is given extra pay for it. Now, near it is an ablution bench for soldiers to wash and shave. They get up in the morning, wash and shave, eat, and go to the latrines. That's much better than to go back in the woods. Personally I favor it very much. I was never annoyed by the odor of a latrine the whole time I was in the British army, nor did I smell feces anywhere, whether in hospital or anywhere else. It was sanitation under very difficult field conditions, and yet it was in the conscience of every private soldier to be hygienic; it was disgusting to him to be otherwise. Now the British were not always so. It is a gradual evolution of their national character from way back in London plague days. The people are really hygienic at heart. And this is the only real basis for practical hygiene—sanitation, where you convince the whole people.

There were two places in which the famous MacPherson latrine was in operation. It was a sort of adaptation of the Child's restaurant idea. They had taken biscuit tins and cut them down so that they would stand about 2 inches high, and fashioned them so that there was a flange on the forward tin that ran back and hooked over the adjacent edge of another tin behind it. A little block was placed in the center under them where they came in contact, tilting the rear one backward and the front one forward. In the rear one was a square piece of newspaper.

There were eight or ten of these unobtrusive biscuit tin affairs on the cement floor. In front of these toilet facilities was a urine trough that led down to a soakage pit. The British soldier went in there; urinated first; went to the biscuit tin; straddled it, performed his duty; then solemnly got up and after cleansing himself picked up the four corners of the newspaper holding the feces he had evacuated and put them in the incinerator; then went back, took the forward tin which carried the surplus urine, and put that in the urine trough, and then went out. Perfect; no dirt; very neat and very nice! I asked the commanding officer how they would make a big outfit do that. He said "This is not for a big outfit." The real secret of it is this: the orderly on duty here is a fairly intelligent man. He is kept here all the time, and his orders are that if a man don't do the cleaning up himself, he, the orderly, has to do it for him. The orderly selected is generally a husky man. He said if any commands come in that don't know very much about sanitation, this is a very good way to work it into their skulls.

Their kitchens were perfect. They were generally open on one side at least, and they were whitewashed inside, tarred outside. Their stoves were all blacked. They had stew stoves that we don't have—Soyer stoves, which they use a great deal for stews, etc. The point was that these places were absolutely clean, and whitewashed or painted; that the cooks had white caps on, white aprons, and were always clean. You don't find somebody with a dirty old hat on the side of his head and sleeves rolled up to his armpits, or going around with a cut-away effect of underclothing approximating the bathing suit—nothing of that sort at all. Everything was bright and clean, and they all took it very solemnly and seriously. The secret was they never had anything showing outside that they weren't using all the time. One of the first things to learn, if you are an inspector, is that when you come to kitchens you are apt to find a cook or a cook's assistant who will say to you when you pick up some old piece of cracker box in a disorderly kitchen, "We need that to put something in"—always have a need for some unsightly trash around the place—brooms, brushes, combs, old shoes, etc. Now people do have a use at times for that stuff—that's a fact; but the British don't allow those things to be out where you can see them. They have a room for such things, cupboards, or some place where they can't be seen, as well as a clothing room for cooks and kitchen police. The place looks clean all the time; and such things have effect on the soldiers—on the appetite, and the respect of a soldier for an orderly, neat-looking place. They say you ought always have a place to stow things away that are not being used every single minute, and those that are out are to be put where they came from

when you are through with them. Such things are always spotlessly clean—knives sharp, well polished—everything of metal well polished, absolutely clean. They have food storehouses and their meat is separated from their bread and other things. Food conservation is down to the finest point in the British army that I have ever seen it in my life—nothing like it. All these kitchens have grease traps; all grease, even grease from the floor, is recovered, rendered and made into ammunition; every single bit of it, except the clean bits from the meat which is used in place of lard and called drippings. These are small details of the workings of a field hospital.

They all have their canteen, their baths, their drying room for clothing, etc. The drying room was generally made this way: There was a Thresh disinfector in which they deloused their patient's clothing. That was always housed in, and the smoke stack, instead of going straight up, went across and then out through the drying room and that heated the room, and in that room they hung their clothing to dry. In connection with this they had their bath. The men went in and took off their outer clothing, passed it out to have it deloused in the Thresh disinfector, which is right there; took off their underclothing, threw it out of the window in a pile; went in, got their soap and towel, took their bath; then went into another room, got clean underclothing and got their sterilized deloused outer clothing; and then went on about their business. That was done with every single solitary man. They had a saddlery and a tailor shop. They have more artisans than we have. They run more to doing work by hand than we do. We have been running to machinery; we have been too much accustomed to having things made by machinery for us, so much so that we have forgotten the humbler trades —cobbler, blacksmith, etc. But in England they have hung on to them. They have an excellent animal corral and their transportation is simply excellent. I saw a number — ten or twelve — of their ambulances coming down a road, running at a good pace, with their quiet motors, slick, shiny, nicely painted, as if they had just come out of the shop, with all the metal gleaming, and I said to the commanding officer, "I don't see how you get new machines." He said, "Those ambulances are not new; they have been in service three years!" I am not exaggerating; you couldn't have told them from new. And their harness! Their leather is pliable; it is perfect. There are absolutely no words you could use that would be too high an encomium for the English harness. All the metal parts are highly polished; they gleam. It is a very imposing sight to see their transportation. Their wagons are always in a perfect state; they keep them in beautiful condition. We attained that here at this school when we had the ambulance company

here. It was easy to attain it—not by punishment, but by appealing to the pride of the men. When an ambulance comes in, or harness comes in, with a lot of mud on it, their duty is to clean it right there. If the man is hungry, tired, or it is late, somebody else does it, but it is done. I have seen it in pouring rain for weeks at a time and it was done every time, every single time. That is the only way you keep your transportation in proper shape. Do you know that the French themselves have only scrapped about fifty automobiles a month for their entire army? Now will you please tell me how many we have scrapped for our entire army so far?

In the M. D. S. I am speaking about here they kept their patients forty-eight hours before bringing them back to the C. C. S. They were wavering about how to employ their M. D. S. They had decided that all serious cases should be sent to the C. C. S. The British say that if a man is seriously wounded his best chance is to get him to a C. C. S. quickly, but they sent some slightly wounded to the field hospitals, the sick, and also cases that were in bad shock, or which ought to be stopped on the way back. They had three of these field ambulances per division. I saw a number of them—all very attractive with plenty of shade; the grounds were kept well, good walks, well laid out; flower gardens provided. The men didn't lie around on the grass. All their men looked well; never slouchy, never; always had their coats buttoned up, their buttons shined. They were an orderly, clean, God-fearing bunch, and it was a big thing to me because it was at the front, under shell fire, where men are killed from time to time. Now don't say it can't be done in the midst of mud and ruins because it is being done in the British army right today.

Now, other things: Mind you, there is always at least one field ambulance used as an M. D. S. per division which is not very large compared to our divisions; then in front of that they had their advance dressing station with a couple of officers and twenty to thirty men, a detail for which they provided by roster. Every six or seven days they sent out another two officers and twenty to thirty men.

These field ambulances were also being used for other things. One of the things they use them for a great deal is a rest station. The rest station started out by being a field ambulance of the division, set aside for the slightly sick or gassed or exhausted; they sent the rest to the casualty clearing station. At the present time in the British army they don't seem to use the field hospital for gas cases; they are sent to the casualty clearing station. This corps rest station will bear inspection, because we want to see what we can do to get something of our own from others, to imitate them or get better things. We saw one corps rest

station which was a field ambulance under the corps surgeon, but detached by roster from the division and kept there for a month or so, in sequence. They would take, say, field ambulance No. 151 for a month, No. 152 for the next month, and so on. That ambulance went in there with its entire combat equipment; but here is the point: the place for it was fixed, and it had huts which were fitted up by the Red Cross, and fitted up well. They brought in the medical and surgical boxes and the personnel, but all the beds, etc., everything else, was provided by the Red Cross. They took in the slightly sick and exhausted, trench-foot cases and cases of trench fever. They didn't do any surgery. They got their case direct from the advance dressing station, main dressing station, or C. C. S., and this place acted very much as a sort of safety valve for the C. C. S. if it got crowded. The battalion surgeons do a great deal toward keeping up the efficiency of the men by sending them into a rest station before they get sick, men who need a rest, men who are tired out; and General Thompson said that sometimes men will sleep for forty-eight hours at a stretch. Its capacity is from 300 to 1,000. They give them rest, recreation, entertainments, theatricals, and plenty of open air. They return 80 per cent to their regiments in two weeks and avoided a great deal of sickness in that way. That's a good thing for us to imitate, and the place for it is in our gas hospital. They were attractive places with reading and writing room, wicker chairs, carpets, etc. They were made as comfortable as they could be made. There was a good gymnasium, library, canteen, barber shop, and all of the usual dependencies. Every one of these places had all these things.

They would pick out a field ambulance here and there for a scabies hospital. That is important, because scabies in the British army is the cause of a great deal of inefficiency. The men get it, but they don't report it until they get impetigo or some other inflammatory skin condition, and then the average time a man is incapacitated is from four to six weeks. It is a tremendously important subject. They have got to get rid of scabies and these scabies hospitals are very necessary. And how these field hospitals do hate it!

Let us take another main dressing station. Its capacity was 150. It was mainly in Nissen huts—no tents at all. It supplied the A. D. S. and R. A. P. stations. For the benefit of those who have just come in I will say that "A. D. S." corresponds to our ambulance dressing station, and it means, in the English service, advance dressing station. "R. A. P." is regimental aid post. They showed us the wonderful care of transport that I spoke of yesterday. Harness and wagons, in excellent condition, looked like brand new. We also saw in this little hospital, meant to handle 150 patients, a barber shop, saddlery, canteen,

baths, separate messes for officers, noncommissioned officers, and privates; incinerators, bucket latrines, beautiful kitchens; a ward for medical cases, one for evacuation, and one for emergency surgery. The whole effect was that of a roadside inn. It was well whitewashed, with neat grounds, attractive chateau, etc.

At this hospital we saw what we saw at every field and every evacuation hospital, that the kitchen had grease traps and that every bit of grease was saved. Ablution benches for the men, hot water for shaving near the latrine and near the incinerator, of course. The incinerator had a pipe connected with a tank which traversed the fire box, and which gave them hot water for shaving in the morning—to show what little detail the British make use of to make their places comfortable. They had a lamp cleaning house, harness shop, blacksmith shop, and dug-outs in cases of bombardment, which they had very frequently. They calculated that most men will be there only forty-eight hours, and notwithstanding that, they had all of these comforts. I am harping on that to see if we can't create some public sentiment against this effete military plan of making men uncomfortable in order to look like soldiers. The discipline was perfect, as it was at all of these English hospitals. The only book they kept concerning the sick was the Admission and Discharge book, which is practically identical to the one we used to have in our service years ago.

Here is another hospital, an English hospital, 4 miles from the line, a field hospital, where they kept patients for some little while, with an evacuation section and a gas quarter. They had wards for slightly wounded that digressed from the plan that slightly wounded shall go well to the rear. They had wards for the gassed. The operating preparations were perfect, with electric light and all of the little dependencies that I spoke of yesterday for the other hospitals—cobbler's shops, etc.

(*To be continued*)

THE SANITATION OF A FIELD ARMY

By Lieutenant Colonel HANS ZINSSER
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(*Concluded*)

(With two illustrations)

The Water Service.—The supervision of the drinking water within the army area falls naturally into a number of phases. There is in the first place the necessity for the prompt discovery of water sources, estimation of probable output of each available source, with a rough sanitary survey of surroundings as indicating the probable degree of pollution. The larger water sources must be located at which it may be useful to establish automatic chloride sterilization apparatus for the establishment of cart-filling points; provision must be made, perhaps, for piping of such water supplies. Finally, there must be strict supervision of the quality of water obtained from these sources.

The arrangements at the present time authorized for the supervision of water supplies in armies are as follows:

There is attached to each Field Army a body of engineer troops who are especially assigned to the water service. These troops maintain an office at army headquarters from which they send out parties of trained engineers and attached sanitary officers to survey as rapidly as possible the entire army area. They rapidly follow up the advancing troops, and in the experience of the past summer we have found that this service has functioned very satisfactorily and with promptness and willingness to coöperate with the medical department. The engineers have furnished maps of water points in the areas, and, by means of this sanitary personnel and attached laboratories, have made bacteriological and other examinations of water supplies and have installed Wallace-Tierman chlorination apparatus, both mobile and stationary, at all points where permanent chlorination plants seem to be warranted. It has been possible to transmit this information to divisional sanitary inspectors when divisions moved into new areas, thus relieving them of the necessity of going over the entire ground themselves. This has furnished an important basis for the control of water supply.

Analysis of any water source is of no practical value unless frequently and periodically repeated. For this reason, after the preliminary survey has been made and gross pollution discovered by bacteriological analysis, this will be of value in indicating whether or not such a source should be completely excluded, but

it is not practical to attempt to control the water supply by periodical laboratory analysis. It is best to assume that all water, except that in which the engineering service has established permanent chlorination apparatus, is polluted and must be chlorinated in Lyster bags or water carts. This must be supervised by a sanitary officer attached to the staff of each division surgeon, whose sole function it is to attend to the divisional water supply. It is the duty of this officer to familiarize himself without delay with the records of the water engineers, to mark the locations of water points and engineer installations in his divisional area, to instruct divisional units in the proper use of the hypochlorite of calcium tubes, and Lyster bags and water carts, and to circulate constantly among the divisional troops, correcting, supervising and enforcing these measures. It is not feasible to furnish such an officer with a laboratory equipment for laboratory analysis, this being both impractical and unnecessary as indicated above, but he can with profit employ iodide and zinc sulphate solution for the control of proper chlorination, and can teach unit medical officers, mess sergeants and others in the division this method of control. Mess officers also should investigate from time to time whether all divisional units are properly supplied with Lyster bags and whether they are having difficulty in procuring a sufficient supply of calcium hypochlorite tubes.

It is the duty of the army sanitary inspector to keep in his office a complete record of the work of the water engineers on a map furnished by them and constantly kept up to date, to see that this information is transmitted to the divisional sanitary inspectors and the medical officers of army units, and to assure himself from time to time that Lyster bags and hypochlorite solution are available and are being used. This he must do by conferring with divisional water officers.

During active combat is often occurs that advancing detachments have no Lyster bags and therefore have difficulty in following our instructions concerning water. When this occurs a number of different makeshifts can be employed, and the army sanitary inspector at such times should be in constant touch with divisional water officers to help facilitate their problems by instruction and advice. By a simple calculation, assuming that one gram of hypochlorite of calcium gives about three parts per million of available chlorine for 40 gallons of water and that this gives a sufficient margin for a successful sterilization, within a half-hour of anything except highly polluted and iron containing waters, the frac-

tional addition can be made to containers of any size such as G. I. cans or anything available. When a small detachment is dug in in isolated positions or is moving in such a way that the men are dependent on canteens, the following method can be used; the platoon leader or sergeant can place the contents of a hypochlorite of calcium tube into his canteen and fill this with water. If the hypochlorite of calcium is available only in bulk he can fill the shell of a 45-cal. revolver cartridge with the powder (a volume which represents about one gram), place this in his canteen and fill it with water. After thoroughly mixing, one teaspoonful of this solution can be put into the canteen of each man. When the canteen is filled with water from any reasonable source it can be assumed that within 20 to 30 minutes the water has been properly sterilized.

Although poison examinations of water have not been found necessary at the present time, it is nevertheless important that some provision be made for the prompt detection of such contamination when troops are advancing over conquered territory. It is therefore desirable to have one of the standard poison examination chests, which are splendid for the gross detection of alkaloids and poisons, in the hands of the divisional sanitary officer, since he is the only trained man who is in touch with the advancing troops. To have those chests in the hands of the water engineers or the corps of army personnel is almost useless.

One of the difficulties encountered in the routine chlorination of water is the occasional failure, by lack of foresight or imperfect coördination with the Quartermaster Department, of units to obtain the needed supply of calcium hypochlorite. It would be best to issue these tubes with the rations. The division should have on hand 7,000 tubes per week, 3 tubes being issued with every 100 rations. This calculation is based on the allowance of 4 quarts of water per man per day.

BATHING AND DELOUSING

It is not our intention to go into details concerning the actual methods of bathing and delousing employed. Those must necessarily differ according to the place where troops are stationed, the numbers to be taken care of, and the means available. The question of bathing and delousing is a quartermaster problem and probably must, to a great extent, remain in the hands of the quartermaster because of the large amount of property involved. The

coördination of the Quartermaster's Department and the Medical Department in regard to this work has been a difficult problem in the past, but can be overcome, as it is being overcome in the Second Army, by two important arrangements. One of these is to make bathing and delousing an army rather than a divisional function, the other to have, in the Office of the Chief Quartermaster, an officer who is assigned purely to this and to laundry arrangements. This officer should be trained in the details of delousing procedures and the organization of bathing, delousing and laundry units. He should have a complete record at all times of all the delousing and bathing facilities possessed by the Army and have experience in estimating the supplies needed for delousing plants of various sizes and constructions. The Sanitary Department of the Chief Surgeon's Office advises him as to needs and locations, and helps him in the choice of sites, water sources and general organization.

The most easily organized and fool-proof units are those constructed on the basis of a Fodon-Thresh steam sterilizer and a converted Adrian barrack. These plants can be rapidly set up whenever an Adrian barrack and a suitable water source are available. They are partially movable and can therefore promptly follow up an advance or adjust themselves to other shifting of territory. Two such plants should be available for every division unless equivalents in the form of other types, permanently placed, are available. In addition to this every battalion should have a separate bath of at least one LeBlanc S-shower head unit. Men should be bathed at least once every two weeks and a careful inspection for lice made at every bi-monthly physical inspection. Delousing should be practiced as a routine at least once a month when divisions are in the line. When lice are discovered the lousy men should be immediately disinfested, and if possible under the tactical conditions prevailing, the whole company unit should be run through as soon as lice are discovered. This procedure is of vastly greater importance during the cold weather of the fall and winter, when trench fever and typhus are apt to prevail and spread most easily. When cases of these diseases appear, immediate, energetic steps to delouse the command must be taken. This is perhaps one of the most important duties a sanitary inspector can attend to, and upon his prompt action under such circumstances may depend the success of military operations.

It is our opinion that frequent inspection for lousiness is a duty the importance of which is not sufficiently emphasized. The early

discovery of lice in a command is as important as the early diagnosis of a communicable disease, and at ordinary times when men are living under reasonably clean conditions, lousiness does not spread with great speed. Early discovery will therefore simplify the whole problem. In carrying out the inspection the public and auxiliary hair and the seams of underclothing should be carefully scrutinized, and the sanitary inspectors must make sure that medical officers are familiar with the appearance of nits. Too often these inspections are made in a perfunctory manner.

While we have neither time nor space to describe the many different methods of delousing which have been used and recommended, the following plan for the rapid establishment of a Foden-Thresh unit may be of interest.

POLICING OF BATTLEFIELDS

Under certain conditions of combat, especially during rapid advances of large bodies of troops, the policing of a battlefield becomes a sanitary problem of considerable importance. This is the case more especially in hot weather, when the dead bodies of men and animals rapidly become foci for the breeding of myriads of flies which infest kitchens and mess-tents and carry infection from the feces almost inevitably accumulated in open trenches and in woods where troops have camped for brief periods in the intervals of active fighting. Under such circumstances diarrhea and dysentery become epidemic, and any defects in vaccination in bodies of troops become noticeable by scattered cases of typhoid and paratyphoid fever. It is even possible—indeed we believe that we have some evidence to warrant the assertion—that many cases of mild fevers with intestinal symptoms occurring at such times represent mild attacks of the typhoid and paratyphoid group of diseases which are typical because of vaccination. Our own experience during the Château-Thierry offensive, as well as the previous observations of the British and the French, has demonstrated the great importance of the sanitation of the battlefield which, in its neglect, invariably leads to conditions that may seriously impair man-power at a time when it is most needed.

To expect troops themselves to live up to the regulations regarding latrines and refuse disposal during the activities of a battle is not feasible, as experience has shown. It is equally impractical to expect them to police the camps they have occupied perhaps for a single night. The burying of their own dead not only takes away

trained men from the fighting units but has a pernicious effect upon the morale at a time when this factor should be carefully nursed. This problem was approached, in the First Army Corps, and later in the Second Army, by organizing companies of pioneer troops, either corps or army units, for the purpose outlined above. A company is attached to each division in the line. On the night preceding the offensive each company is marched to a position behind the respective divisional line and reports to the sanitary inspector of the division. The liaison and preliminary arrangements are attended to by the army sanitary inspector. These troops then follow in the wake of the advancing infantry attending to the work indicated. By dividing them into squads spread across the width of the divisional front, the entire advance can be policed, even when the country is thickly wooded as in the Argonne.

The following extract from a Second Army order illustrates the system in sufficient detail:

1. Memorandum No. 8, these Headquarters, 26th October, 1918, emphasizes several provisions concerning the burial of the dead, which are covered by General Orders Nos. 10, 30, 50, 89, 106, and 122 and Bulletin No. 41, G. H. Q., A. E. F., 1918.

In order to carry out these provisions and to facilitate the prompt burial of those killed in action, the following arrangements will be made in your corps:

"(1) The administrative order pertaining to the field order will direct that one company of pioneer infantry or equivalent, with the necessary picks, shovels, ropes, teams and wagons will be assigned to each combat division. The commanding officer of this company will report this organization in due season to the division sanitary inspector, under whose direction the dead men and animals will be buried.

"(2) Three chaplains from each division will be detailed for temporary duty with this pioneer company. In addition to their religious duties they will act as burial officers and secure the effects of the dead and dispose of them in compliance with existing orders.

"(3) In addition to the duties outlined above, the pioneer company will be used to police the temporary camps of rapidly advancing troops.

"(4) Upon cessation of an action, and after the duties directed have been performed, the sanitary inspector will request orders returning the pioneer companies to their proper stations.

"(5) These arrangements for the burial of the dead will be enforced only during and immediately after an action. At all other times, the burial of the dead will not be a function of the Sanitary Service."

Respiratory Infection and Evacuation.—During action, especially under circumstances like those which prevailed in the Ar-

gonne, where many of the men in the line were exposed to wet and cold for long periods and developed grippe, a problem of evacuation of considerable sanitary importance arises. Efforts must be made to evacuate such respiratory cases separately from the wounded, and especially from the gassed. In both instances, more particularly in the latter, the respiratory cases may transmit to the latter streptococci and pneumococci which may determine the death of the patient. In one division of the Second Army it was recently found possible to mask all respiratory cases which came out of the line and keep them masked until admission to a hospital.

RESERVE AREAS OF ARMY WHEN IN THE LINE

When divisions have been engaged in active combat during which their casualties may have amounted to several thousands, and are then taken out of the line to an army area for replacements and reserve, their sanitary conditions are apt to sink to a low level if left to their own devices. Men who have lived under combat conditions, who have gone through harassing weeks of peril and exertion, are physically worn out and mentally strained. They invariably, when withdrawn from the line, relax, both mentally and physically, and it seems poor economy to expect them immediately to take up the routine of camp life and to begin their rest period by cleaning up and policing their new area, digging latrines, and in other ways establishing the sanitation of their camps and billeting area. It has happened in the past that such divisions had to be stationed in areas recently abandoned by divisions that have gone forward to take their places. The consequence was that insanitary conditions, with dangers especially great for men in their condition, prevail for a week or ten days, that is, until the division had been brought back to a more or less normal physical and mental state.

It is advisable for the Sanitary Inspector of the Army to make the preparations and the supervision of reserve army areas a part of his activity, to keep in touch with the movements of troops in and out of these areas and to endeavor, with the aid of his sanitary squads, to assist in preparing them for the reception of troops coming out of the line. The troops thus finding the areas in good condition are relieved for the first week (which is a difficult one for them) from extensive sanitary policing, and can take up this work themselves by the end of that time.

PROBLEM OF REPLACEMENT DIVISION

One of the important sources of the admission of infectious disease to divisions of an active army is the Replacement Division. A replacement division is usually located somewhere in the reserve area of an army, and through it pass a large number of casual troops, which, after some training and perhaps reclassification and equipment, are sent out to divisions in groups varying from a fraction of a platoon to a platoon, and larger units to divisions that require replacements. The division, therefore, represents the small end of a funnel through which all kinds of contacts of communicable disease pass from the S. O. S. into the army. Also troops that are held for some time in the replacement camp may there be exposed to disease, which may subsequently be scattered by them to many different units throughout the army area.

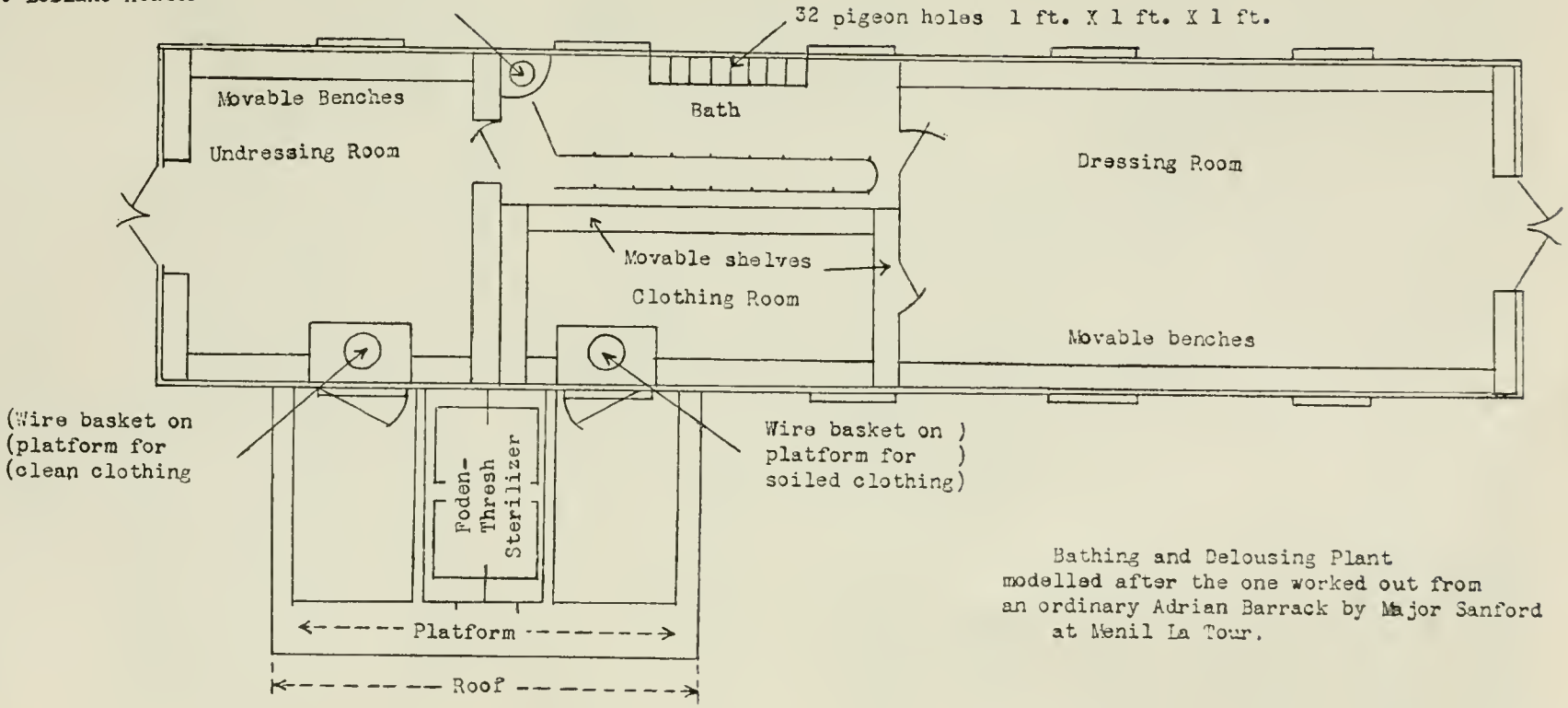
The replacement division, therefore, is one of the focal points which should have the especial attention of the army sanitary inspector. This division should establish a reception camp in which new arrivals are held until their medical examination can be made before they are turned into the main camp. The sanitary inspector of the replacement division should have special sanitary squads at his own disposal, and the laboratory of a replacement division should be more extensive, both in equipment and personnel, than that of the mobile divisions. Cultural work of all kinds should be possible.

When cases of infectious disease occur in a replacement division, prompt epidemiological surveys should be made and measures taken to prevent contacts from being sent to other divisions until the expiration of the incubation time. When cases of infectious disease occur in the army itself, an endeavor should always be made to find out whether the patient or his contacts have been recently added to a unit from the replacement division. In this way it may often be found that the origin of the disease is in the replacement division and that the point of approach for sanitary measures lies in that division rather than in the unit in which the case developed. The Sanitary Inspector of the Army should keep in constant and immediate touch with the office of the chief surgeon of this division.

ALTERATIONS IN SANITARY ORGANIZATIONS WHEN AN ARMY GOES INTO REST AREA

When an army is taken out of the line, divisions are usually placed in separate rest areas, which remain definite divisional areas for a more or less prolonged period. These divisional areas may not

Chas. LeBlanc Heater



Bathing and Delousing Plant
modelled after the one worked out from
an ordinary Adrian Barrack by Major Sanford
at Menil La Tour.

be in direct contact with each other, there being considerable stretches of unoccupied territory between them. In such a case, the area scheme above described is not feasible unless the personnel of the Sanitary Inspector of the Army be vastly increased. It is best under these circumstances to have the trained army sanitary squads make preliminary surveys of the areas to be occupied by the divisions and to turn over to the divisional sanitary inspector all information, together with recommendations and advice concerning the establishment of latrines, baths, delousers and other locations, and estimates concerning the amount of construction work to be done. After the division becomes established it will be best to station the available army sanitary personnel at various points from which the divisional areas are accessible and to limit their functions to those of inspecting and advising. The commissioned officers of the army sanitary squads should periodically cover a definite area; should be prepared to assign some of their trained personnel to the service of division, corps or army troops in instructing them in the construction of baths, latrines, incinerators, etc.; they should be on call for special rapid epidemiological surveys for infectious disease as reported from any of the divisions. In this way the chief responsibility of the sanitation of divisional areas remains as it should—with the divisional authorities, who, however, benefit from the reinforcement by trained army personnel, and from the assistance of men experienced in epidemiological work and the handling of acute outbreaks of disease.

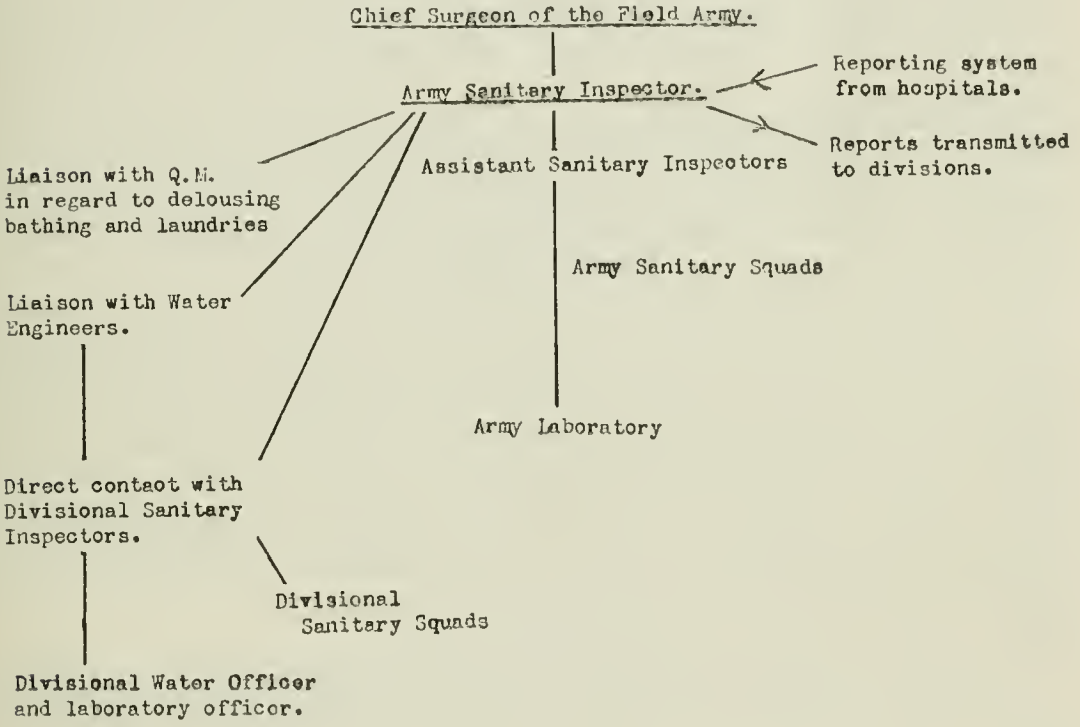
Should There Be a Corps Sanitary Inspector?—The Sanitary Inspector of an army corps can be of great usefulness, especially when, as frequently happens, the corps operates as a more or less independent unit. Since, however, the corps is almost entirely a tactical unit, with frequent shifts of location and with divisions attached to the corps changing repeatedly, as strategy demands, it is best to have the Corps Sanitary Inspector purely an advisory and inspectorial officer, who is particularly engaged in the supervision of the sanitation of the corps troops and forms a liaison of information between the divisional sanitary inspectors and the Sanitary Inspector of the Army.

DIVISIONAL SANITARY SQUADS

It seems essential that divisions in the army should retain their sanitary squads, as organized in the past. These two squads of twenty-six men each, under the command of two commissioned

officers, should become divisional troops and remain so, whether the army is in action or in rest. They will not in any way interfere with any of the plans described in the above outline; they are so few in number that they represent no important additional encumbrance to transportation, nor do they detract or abstract men from the fighting units to any important degree. They are, however, a unit which can be trained and can render highly proficient work in the instruction for sanitary construction and can thus add considerably to the safety of the troops.

The following schematic representation summarizes the army sanitary organization:


Chief Surgeon of the Field Army.
Army Sanitary Inspector.
Reporting system from hospitals.
Reports transmitted to divisions.
Liaison with Q.M. in regard to delousing bathing and laundries
Assistant Sanitary Inspectors
Army Sanitary Squads
Liaison with Water Engineers.
Army Laboratory
Direct contact with Divisional Sanitary Inspectors.
Divisional Sanitary Squads
Divisional Water Officer and laboratory officer.

THE SURGICAL TREATMENT OF EMPYEMA OF THE THORAX[1]

By Lieutenant Colonel HOWARD LILIENTHAL
Medical Corps, United States Army

EMPYEMA of the thorax is not, as a rule, unilocular, and therefore drainage by incision and insertion of a tube or by simple rib resection will effect only about 33 per cent of cures. The death rate in acute pyothorax has always been very high, both in children and adults. A mortality rate of less than 25 per cent has been considered a good showing, while frequently even this percentage did not take into account the secondary operations which would be necessary for a final cure.

Each patient presents an individual case and no single method of operation will fit the needs of all. Secondary collections of pus may not break into the main cavity but may invade vital parts with fatal results. The lung is frequently contracted by an inflammatory exudate upon the visceral pleura; this exudate rapidly becomes tough and unyielding, binding the lung down permanently, thus causing the loss of functioning aeration area with unilateral contraction of the thorax. This membrane usually forms very early in the disease so that at the end of ten days it is already quite tough and unyielding, though readily stripped from the lung. Often the chest is divided into several chambers, each with rigid walls, so distributed that the drainage of one cavity rarely accomplishes more than to permit overflow from the others. Those patients with discharging wounds, rigid chests, and scoliotic spines require extensive and dangerous operations for the mere closing of the sinuses, and there is frequently a permanent loss of lung capacity with much deformity.

Another not infrequent result of undrained sacculation is perforation into a bronchus with a resulting lung abscess, a condition difficult to cure.

There are, then, two problems in the treatment of empyema of the thorax: the first, to save life, and the second to prevent chronic disability. Both of these objects are more likely to be attained if at operation comparatively early in the disease the lung is made to expand properly, and no undrained spaces are left. It is repeated that no one type of operation should be selected arbitrarily to the exclusion of others. On the contrary, the procedure decided upon should take into account the results of analysis yielded by the history, the physical examination, the

[1]This paper was written as a short, general guide for military surgeons in the American E. F.

radiography, and the general condition of the patient. Naturally the last is the most important. The bacteriological findings, with the exception of tuberculosis (not considered in this paper), are of little importance in deciding upon surgical methods. Before the chest has been opened by scalpel or needle the X-ray frequently shows a general opacity of the whole or part of the affected thorax, but as soon as air has entered and part of the fluid has been withdrawn, the distribution and number of cavities can usually be determined and the next operation planned in advance.

METHODS OF OPERATING IN EMPYEMA OF THE THORAX

General directions. (Exceptional cases may demand exceptional treatment).—This discussion deals with non-tuberculous empyema, the diagnostic methods, the bacteriology, points of morbid histology, etc., not being here considered.

In empyema the mediastinum is always more or less rigid because of plastic exudate upon its pleural side. There is, therefore, no danger of the fatal mediastinal flapping so common when the uninflamed thorax is opened as in the case of recent gun-shot wounds.

GROUPS OF CASES

A. Acute with the chest full of pus and immediate danger to life; cyanosis, dyspnea, and sepsis present.

B. Subacute and chronic, often long unrecognized, little fever, cyanosis absent, shortness of breath on exertion but otherwise no dyspnea.

C. Chronic cases with thoracic sinuses and undrained cavities, following operation.

PROCEDURES

Group A. 1. Radiography if there is time.

2. Minor thoracotomy.

3. If there is not what might be called "normal" improvement within six days following minor thoracotomy, there should be fluoroscopy and radiography in the erect posture. If collections of fluid are seen, major thoracotomy as described below.

Group B. 1. Radiography and fluoroscopy in the erect posture. In these cases the affected side is contracted and the ribs closer together than on the sound side, whether the empyema be sacculated or general. Stereoscopic study is desirable.

2. Major thoracotomy (see below), unless the empyema is encapsulated and occupies only a small part of the chest, when it is desirable to resect one or two ribs with the periosteum, directly over the empyema, packing the cavity lightly with gauze and treating it as an abscess. The

healthy neighboring pleura should not be entered, and lung mobilization is usually unnecessary.

Group C. 1. Careful X-ray study with fluoroscopy and pictures. Cases should be selected for operation with consideration of the interval since primary operation, the character and shape of the cavity, and the power of the patient to fill this cavity by distending the lung by blowing or straining.

2. Preparation for operation by disinfection for four to six days by Carrel's method. (See paragraph 1, under Thoracoplasty with lung mobilization.)

3. Thoracoplasty with lung mobilization (described below); no collapsing operations of the chest wall.

DESCRIPTION OF OPERATIONS

I. Minor Intercostal Thoracotomy

Posture: on the well side slightly toward the abdomen; knees and hips flexed; pillow between the knees and another beneath the thorax; legs held by straps passed around the table; thorax kept in position by sand bags; arm behind patient as in Sims' position.

Local anesthesia. A short incision close to the upper border of the rib in the 7th or 8th intercostal space, posterior axillary line, with insertion of a small thick-walled tube, connected with a long tube passing below the surface of an antiseptic solution in a bottle beside the bed. Dressings held in place by adhesive plaster; no bandage.

II. Major Thoracotomy

General anesthesia, preferably by the intrapharyngeal method.

Posture: patient on the well side slightly toward the abdomen; knees and hips flexed; pillow between the knees; legs held by straps passed around the table; thorax kept in position by sand bags; a cushion under patient so as to enlarge the intercostal spaces on the diseased side; arm behind patient as in Sims' position.

Incision in 7th interspace hugging the upper border of the rib, from its angle to the cartilage. The vessels in the latissimus dorsi, serratus magnus and other muscles are caught before they are cut. Pleura is entered by short incision and fluid allowed to escape slowly or, better, withdrawn by suction apparatus. Pleural opening enlarged with scalpel or scissors until entire length of the wound has entered chest. Care must be taken of diaphragm anteriorly. Blades of powerful rib retractor are inserted and spread gradually. A separation of from 4 to 6 inches usually possible. All fluid and lymph coagula are removed. Hemorrhage is insignificant up to this point, and in empyema there will be no respiratory embarrassment. Exploration by sight and touch of

all visible parts of the thoracic cavity. Any soft adhesions to the chest wall, mediastinum and diaphragm are broken down and the pulmonary lobes separated. If, however, as is usual, a more or less tough confining membrane has already bound down the lung, so that all landmarks are obliterated, an incision is made with the scalpel through this membrane from that part of the cavity nearest the apex, to the base. Usually this incision will be immediately spread by the underlying lung which will force its way toward the chest wall. Lateral incisions at right angles to the first may now be made with scalpel or scissors when still freer lung expansion will be secured; a procedure also rarely accompanied by hemorrhage.

A slight wounding of the lung with the appearance of fine bubbles need not cause alarm; coarse bubbling, however, would signify entrance into a bronchus. In recent cases this may always be avoided. It is not necessary, except in the presence of secondary pus collections between the lung and the costal pleura to break down all adhesions to the chest wall. It is most important, however, to lift the lower lobe from the diaphragm, for here separate pus collections will not infrequently be found especially when the lower lobe appears atelectatic. Care must be taken not to confuse this lobe with the diaphragm itself. When full mobilization has occurred the lung will crowd toward the chest wall and into the wound on insufflation by the anesthetist or upon coughing or straining by the patient. The rib spreader may now be removed, and the wound closed by layer suture; the muscles with chromicized catgut No. 2, the skin with silk sutures. It is not necessary to draw the ribs together by special suture. The separation of an inch and a half or more between the ribs will close to normal approximation within about ten days after operation. Openings for drainage may be left at the angles of the wound, and split tubes or rubber dam may be inserted.

This large wound rarely becomes infected, probably because there is free drainage into the pleural cavity, the skin healing *per primam.* The usual dry gauze dressing is now applied and held in place by adhesive straps which must not encircle the chest. There should be complete healing within four weeks in simple major thoracotomy, and it has been known to occur in ten days.

Thoracoplasty with Lung Mobilization

Preliminary disinfection by Carrel-Dakin method. Great care is necessary in the intrathoracic application of Dakin's fluid because even a minute and unsuspected bronchial fistula will lead to the actual "gassing" of the patient.

Anesthesia by intrapharyngeal insufflation. (See below.)

Posture as in major thoracotomy.

Incision in 6th or 7th interspace as in major thoracotomy. The chest in these cases, however, will be found rigid and separation of the ribs impossible. From one to three or even four ribs will have to be divided with bone forceps, at the posterior angle of the wound, upward or downward or both as the case may demand. The rib spreader may then be inserted and the entire cavity laid open to the most searching exploration. Making the incision through the old sinus should be avoided. Lung mobilization is now proceeded with by incising the visceral layer of the confining membrane from the apex to the base of the cavity. In these cases complete exploration of the uninvolved thorax is unnecessary, the X-ray will have demonstrated the location and general form of the cavity. If the membrane cannot readily be peeled off in spite of incisions at right angles to the first it will be necessary to make numerous crosshatchings (Ransohoff) over the entire visceral wall of the cavity. The anesthetist will then insufflate and distend the lung as far as possible. If complete distension has been secured prognosis is excellent. Very rarely one encounters fibrosis of the lung so that expansion will not take place by insufflation, coughing or straining. In these rare cases it is probable that at some future time a collapse operation may be unavoidable. Having mobilized the lung a forceps is passed into the cavity from the old sinus, and a piece of iodized gauze is drawn through from the wound of the chest outward, reaming out the tract. A piece of rubber tubing is then drawn through the old wound just long enough to reach the inside of the chest. If there is a tendency for the divided ends of the ribs to overlap, a short piece may be resected so that the ends do not touch. The wound is now completely closed by layer suture, chromicized catgut being employed for the muscles, silk for the skin.

Postoperative Treatment

Morphine in full doses should be given for the first twelve to twenty-four hours. The patient is supposed to keep the lung distended by blowing exercises as soon as he is well out of the anesthesia. In the war hospitals a simple blowing apparatus can be made by attaching a rubber tube to a pneumatic pillow, and tying a string around it so as to cause a stricture through which air is blown with difficulty.

A profuse discharge necessitating frequent changes of external dressings will be present for the first two or three days. Intrathoracic conditions during convalescence must be observed by means of the X-ray, preferably by fluoroscopy. The operation is rarely accompanied by severe shock, in spite of its apparent magnitude.

Anesthesia

The administration of ether by intrapharyngeal insufflation is a simple matter. The apparatus required is a foot bellows or hand bulb with secondary bulb like that of Paquelin's cautery. An ether bottle with two tubes through the stopper arranged so that the ether vapor passes through a tube or catheter, size about 14 French. The patient is first anesthetized in the usual manner, then the tube or catheter is passed into the nostril not farther than the pharynx (a distance of approximately 3½ inches, which should be clearly marked on the tube with a piece of adhesive plaster so that the proper length may not be exceeded). If the tube is too long there is danger that it may pass into the deeper pharynx or even into the esophagus, causing ether distension of the stomach. Gentle blowing will drive the ether vapor into the pharynx, where there is maintained an increased atmospheric pressure. Increasing the force of the stream of vapor will slow the respiration of the patient. If the ether is to be intermitted, air may be forced through this same tube. To distend the lung it is but necessary to close the patient's opposite nostril and place the hand over his closed mouth. The operator will be able to guide the anesthetist as to the proper amount of force to be used in pumping.

If nitrous oxide is the anesthetic employed no bellows will be required.

Warning: Be sure that no liquid ether can possibly be blown into the patient's pharynx.

THE MEDICAL DEPARTMENT IN THE LINES OF COMMUNICATION, A. E. F.[1]

By Brigadier-General FRANCIS A. WINTER
Medical Corps, United States Army

IN CONSIDERING this rather broad topic, it is felt that there can be submitted to you this evening only a brief résumé of some of the work done by us of the Medical Corps in France during the period from July, 1917, to March, 1918. During this period of nine months the Medical Department of the Line of Communications existed as a separate organization, and it was my good fortune to be the chief surgeon of the command under Major Generals Blatchford and Kernan. In March of 1918 the office was consolidated along with other staff corps offices and fell under the immediate control of the Chief Surgeon, A. E. F.

It has seemed to me worth while that I make a departure from the strictly medical aspects of our endeavor and try to put before you some of the problems of medical administration met by us, the troubles we had to meet, the solutions we made and the failures which inured to us, quite as the usual result of trying to do big things. Able scientific minds will analyze and lay before you in time the purely medical side of our history, and I shall endeavor to tell you, in the main, of those things which came up for solution, to be met by common-sense and the application of every-day wits.

First of all let us look for a moment at the problem. We were sent 3,000 miles from home—into a friendly country, to be sure, but depleted by three years of devastating war, backed and intensified by interruptions in its commerce by the ever-vigilant and altogether unscrupulous submarine. It was our job to figure out what we should need, to care for the sick and wounded of an enormous army, and distribute it in the proper places when we should get it in France. No one knew how big the army was to be, and we simply figured that so many divisions of

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[1] The foregoing address was delivered by General Winter before the Medical and Chirurgical Faculty of the State of Maryland at a recent meeting and will be published in the bulletin of the Faculty. As the bulletin has a limited circulation it is not probable that it will reach the large number of those who, as members of our Association, are entitled to the privilege of reading and thinking over the conclusions drawn in this very earnest and scholarly address.

It is due to the courtesy of the Medical and Chirurgical Faculty that we are enabled to print General Winter's address.

It is also with particular pleasure that we give it space in our pages. In the May issue of The Military Surgeon, in an editorial entitled "Let's Take Off Our Clothes," we voiced in a less forceful manner the things which General Winter so convincingly tells us in this address.

We are confident that what he has said will be pondered over both by those of the profession who make military medicine their life work and by those who came to it for the time being in a spirit of cheerful sacrifice, to meet, like good Americans, their country's need.—James Robb Church.

28,000 men each would need so many supplies, and so many officers, nurses and men of the Medical Department to look after their medical wants. The cables were worked overtime and America responded, whole-heartedly and steadily, to our demands.

The supply question, in so far as it related to articles for medical use, is interesting enough to merit a short reference. The French gave us one port to begin with, and for several months all our business was done through St. Nazaire, at the mouth of the river Loire. That town was no Acadia, and it was no pleasure party to sojourn there and hustle medical property off the docks and into railroad cars which were to carry it up to the lines. But we had some faithful officers and men at work and they pushed the task along. Cargo came off the ships in the utmost confusion, and the few men we had worked incessantly to get the stuff segregated and shipped out—but we did get it done, and before long it was being collected by railroad, into our supply depot located at Cosne, a funny little medieval town, about 120 miles due south of Paris. The depot force here sorted it out, issued it on requisitions and, having begun about August first, we were carrying on well by the first of October.

As I have said, America responded well and, generally speaking, the supplies were well balanced and in good quantity. It often happened that we struck a dangerous ebb in the flow of stuff and were often compelled to beg of our good French friends, who helped us out, as did the Red Cross.

We finally struck a real stride on what we called automatic supply, devised by our General Staff. We figured out just what each division needed for one month, then we estimated the ship tonnage necessary to carry that stuff to us and notified the authorities at home how many divisions wanted supplies in France. The good people over here did the rest, and, six months after we began the game, we certainly had the business of troop supply going smoothly.

We put in a big depot at a point near the front lines called Iss-sur-Tille, and thus helped the chap in the battle lines. It was not all easy sailing, and, if I did not feel that it would bore you, I might unfold a story of stray shipments, over-congested railroads, deficiencies in trucks, and battles with mud and sand, which would show how our medical officers were embarrassed at many turns.

One of our great problems was that of motor transportation. I need scarcely say that it was fearfully difficult to get it, in anything like adequate amounts, from the United States. Cargo space was so scarce and food and clothing so imperatively needed that we suffered from lack of ambulances and passenger cars, and especially from the absence of parks to set up and repair what we had.

Sanitation in France was a difficult nut to crack and, looking back on it all, I am really amazed that we came out so well. One can't make a sanitary regime at all worth while unless one has appliances and material things to do it with. I may instance lumber as one of the many things we lacked, and you will not have to stretch your imaginations very far to reach a general idea of what the deficiency in this article implied. Housing, food preparation, bathing, and disposal of excreta were some of the things which one couldn't carry out without lumber. Gradually the deficiency was supplied in this as in other concerns, though there was never a time when we did not lack many essential things.

It doesn't take a meteorologist to establish the fact that it is more than humid in France. Any garden variety of observer will agree that the word of euphony does not meet the situation, and "wet" is reasonably the term of election. Mud is, of course, the corollary, and we got plenty of both at all times. It began at the base ports and carried on to and into the trenches.

There is a certain psychology in making men stack up to sanitary prescript. When a soldier is continually and hopelessly wet and muddy, without the means to dry out, it sounds rather flat to urge upon him that he hunt an added increment of wetness and muddiness, by "tapping the bog" for a hundred yards, to reach the place where the calls of nature may be carried out in a centralized fashion. His primitive instinct gets the better of the academic inculcation. The result is obvious. Again, you can't crowd men into an insufficient barrack, where air space and floor space are both lamentably deficient, and expect them to cough and sneeze into a handkerchief. Quite as impossible is the effort to enforce cleanliness of the body when there are no bathing facilities and no means of getting new, fresh clothes to substitute the old ones, which have done overtime work. But you can't have adequate clothing and bath houses always at hand, when an expanding army is operating 3,000 miles from home and tonnage is as scarce as submarines can make it, so your vicious circle holds the boards.

I believe the spirit of the army is what carried us through, for the men did struggle against the forces in conspiracy against them, and, by dint of their earnest efforts, they kept comparatively decent.

Lice have become an international celebrity during this war. Parlor conversations do not stagger and lapse when a subject, so loathsome to our society of ten years ago, gets on to the tapis, under the euphemism of "cooties." This march of progress, or declension of nicety, justifies an aviator, fresh from a German prison camp, in showing his hero-worshipping girl friends his scars of insectuous voraciousness. Lice interest

me also, and, whether on a knight of the air or a mud-crushing doughboy, they constitute the basis for our greatest sanitary failure, greater even than the enforced overcrowding of our barracks during the winter season. I believe I learned one lesson from this war, and that lesson urges the transfer of the amiable "cootie" to the exclusive care of the Medical Department as a disinfection problem.

The A. E. F. was in error, I think, in confiding them to the Quartermaster Department, and I feel satisfied that the Medical Department should assume the burden of disinfestation and launder and sterilize all clothing requiring such special treatment. We failed to get out appliances to do this work and, while we could boil underwear, olive-drab outside clothing could not be so readily cleaned up. We later got the necessary agencies to work, and it was possible to clean the men promptly.

We had to persuade the General Staff in France to see our viewpoint and work on it in a number of instances. A great measure of practical education for everybody was carried forth in the days when so many new problems had to be met, and when the armistice came we knew our General Staff and I believe they knew us, and there were mutual esteem and due consideration on both sides. Surely we got fine results at last, largely, I think, because we had representation in the General Staff, and responsibility, too.

The great big man who headed our force was always with us, and General Pershing knew, and showed he knew, the kidney of his Medical Department. His great qualities of leadership took us into his following wholeheartedly, and to lighten his load and soften the rigor of the ultimate responsibility for 1,000,000 men, which rested on him, was our task and our pleasure. I believe we felt quite sure that when we helped a poor unfortunate doughboy, we were indirectly helping the fine man and resolute leader who gave inspiration to the expedition.

Taken by and large, I feel that we may congratulate ourselves on our general result in conserving the health of our men. We had 45,000 deaths from gunshot casualty and 22,000 from disease, and that is a very creditable showing to put forward in statistics, comparative to those of other wars. What a record we might have had without our pneumonia scourge is one of those things governed by the awful *if*. That blasting epidemic was a big blot on our escutcheon and, in the light of facts which have come to my notice, I am almost convinced that the shelter of the sky is preferable to that of roofs, under prevalence of respiratory epidemics. The 1st Army Corps, with its billet in its hat, came out pretty nearly unscathed, while organizations under shelter got a full distribution of it, other conditions being, if anything, unfavorable

to the 1st Corps. We have the mastery of practically all the devastating diseases which have followed armies, and the respiratory group alone remains to mock our effort. Let us hope that the puissant intelligence of our splendid investigators and research men will speedily lay this menace, along with yellow fever and enteric fever.

I deny that enteric fever was a real menace to us, in spite of the impeachment lodged in the intemperate head lines of a Washington newspaper of recent issue. You all know that, to our present attitude of mind, it takes but a few cases of typhoid go get the ax of the central authority into action, though the wielding of the ax doesn't indicate anything but the stiffening of the forces which we command and which we know to be sovereign. Over and far beyond the sanitation of places, our prophylactic work still minimizes enteric fever.

You know what our record has been in the matter of one of the great scourages of armies, venereal disease. Young men reporting from the civil population to army camps have carried a venereal rate as high as 175 per thousand. Did we not have full justification for the chuckle which we emitted when our rate was hammered down to 30 per thousand —and this with a bunch of "single men in barracks" who were nowhere near to being "plaster saints." Two of your fellow-townsmen, Colonels Hugh Young and George Walker, contributed everything to this result, but while Baltimore might claim them in the genesis, they were ours in the time of real fruition, at least in so far as the military business went. They would not stand for an omission of the name of Col. E. L. Keyes, of New York, from this particular galaxy of real husky workers, and Colonel Keyes must go into the token of appreciation as a full partner.

Alcohol got a black eye in the A. E. F. early in the history of that Odyssey, and why and how our men kept out of it I don't pretend to know, in any degree of entirety. Whether it be due to the light alcoholic content of the wines of France is questionable. Spirits could be had for a small consideration, both in France and England, and a full bottle was by no means beyond the limit of a youngster, with a month's pay in his clothes and a thirst for a man-sized drink in his fauces.

Again, it seems hardly possible that the widely prohibited area at home, sending out young men who knew nothing about alcohol, could have been entirely responsible for our clean slate. The consciousness that there was a job to be done—and done effectively—may have conspired to the result, and I by no means think it convicts me of a molly-coddle, mawkish sentimentality, when I say that I believe the idea that mother and the girls at home didn't expect a fellow to tread the primrose path of dalliance was a factor of moment. This young army of ours carried the benignity of mother's face with them in goodly numbers,

and there is no question that it was a well-diffused and a substantial reason for decent living.

Rigorous discipline did its share, and our uplift, social organizations did theirs in that they put diverting and entertaining influences before our young exiles. Personally, I am a real enthusiast on the work done by our Y. M. C. A. I saw that work in northeastern France during the trying winter of 1917-1918, and those chaps who put up their recreation tents out in the wind, rain and mud of that inhospitable area were real crusaders and had the spirit of the missionary with them to a beautiful finish. I think they will some day get the grateful recognition which now, in the epoch of iconoclastic criticism not confined to any one class in its manifestation, is denied them.

All these things were factors, doubtless, but whatever may have been the impulsions, the behavior of our men was truly wonderful, and it is my proud boast, as an American, that in seventeen months, whether in Paris, Tours, along the lines in France, or in the hospitable, drink-inviting atmosphere of London, I did not see a half-dozen drunken American soldiers.

That is a contrast picture to some others I might paint, and God knows it was and is, inspiriting. The thought that it was my privilege to see this makes me forget the nights when I had to go to bed to get warm and the days when there was no American radiator to purr its friendly warmth off in the corner.

I believe it will not be questioned that the Medical Department in France came out of this war with the hall-mark of sound quality and excellent service stamped on it. To do big things successfully must rest with the human factor put to the work, and in our personnel we found our most potent agent for good.

For thirty years it has been a matter of pride to me that I could claim fellowship with the guild of medicine and surgery, but it remained for this war to cap my fabric with an admiration for that fellowship which is quite a dogma in my list of things that I know to be right and appropriate. I had seen the brotherhood tested and it rang true, but I had seen the day of small things only and did not know the full story of the consecration as I do now.

To our doctors, our nurses and our fine enlisted men I make the obeisance they deserve, and you will give me the privilege of telling you why I lift my hat.

We may first concern ourselves with the physicians and surgeons who came to us from their comfortable office and home surroundings in America—in most cases voluntarily, and with no reservations. Leaving their homes and the handsome incomes which were theirs, they went into

surroundings and habits of life new to them in all respects, save their bedside work, and carrying discomfort and inconvenience every hour of every day. In ninety cases out of a hundred, financial loss was their steady portion. I watched many a base hospital unit, staffed by the Nestors and the younger men, and I saw the grossly inadequate provision for comfort and the heart-breaking enforcement of professional idleness which fell to their lot in the poorly arranged schoolhouses and public buildings which depleted France, out of her slender store, managed to scare up for us as hospitals. The daily routine was for months the trying one of inactivity, and, if Satan looked for a setting to dole out his mischief for idle hands, this was the chance of his ancient life. It needed resolution and stern devotion to a cause to stand up under the mud, the cold and the change of station, which ofttimes changed, like the gambler's luck, in that it got worse. Laboratory and surgical specialists bossed a gang of men on the docks, getting the precious equipment of the unit on to freight cars, and the hands which normally handled the fine adjustment screw of a microscope at home hustled the box of drugs on the wharf at our Gethsemane, the port of St. Nazaire.

The great men who went out as the directors in our hospital units had a multifarious task. Theirs was the fate to sustain the established high morale and harmonize and keep asperities under control. It would have been entirely millennial had there been no asperities under such conditions of living, but men like Fred Washburn of Boston, Charles Peck and Charles Gibson of New York, Angus McLean of Detroit, R. T. Miller of Pittsburgh, J. M. Flint of New Haven, and your own splendid John Finney, carried along the current of the sporting blood and cemented the morale. These men are but samples of the real human stuff at the top.

It happened, I am sorry to say, that unfortunate "misfits" among regular officers were occasionally detailed to command some of our people, but sooner or later we got the rectification by appropriate orders, and it was the exception.

The officer personnel of these units was so admirable that it is entirely pleasant to think of them in the retrospect. The dominating idea was service to America, to the unit and to the poor chap who made appeal in his hour of misfortune to the skill of the doctor and the great heart which he knew to underlie and galvanize that skill.

How much those fine doctors did to exalt the morale of our fighting forces, can only be known to one who has heard the soldier man talk about it, and it has been my privilege, in many places, to hear him tell of the uplift which came to him when he realized that the best of America's medical profession awaited him in a base hospital.

To be sure it might be that the flooring in the rude barrack buildings, used as hospital wards, would show cracks of a half-inch between boards, and the cry for linoleum to cover those cracks was met from my office by the sad and unavailing news, that the S. S. *Raven*, Plymouth to Cherbourg, had been sunk in the English Channel with 70,000 square yards of linoleum, destined for us. This didn't help, but it did in some measure explain why the Carrel-Dakin solution froze in the wards at pitiful old Bazoilles-sur-Meuse, another Gethsemane, known to your Hopkins unit, and where coal was $70 a ton and rare at that.

I do not wish to convey the impression that it was only in these units that our doctor men were shining lights. There was much excellence all along the lines, and first class medical talent functioned at many small camp hospitals and with detached units. Of course we got some goats among the sheep, and I have always deplored the fact that the first officer dismissed by general court-martial in the A. E. F. for drunkenness was a medical officer. But these delinquents were notably the exceptions, and one may never hope to find a more altruistic, self-sacrificing, devoted set of men than the medical officers who carried the burden in the lines of communications during my identification with it. And they were the fellows, fresh from civil life, who bore the brunt and did the chores in cheerful coöperation with the handful of regular medical officers who were available for duty abroad.

Just here it is fitting to say that we went along as a very happy family in France and England without any internecine strife, based on contention between the man from civil life and his professional brother who had made the service his life calling. I may again refer to the fact that we had some regular officers who failed in their work and brought discords, just as we had a sprinkling of non-adaptables among our Medical Reserve Corps men, but I believe the vast majority of the Regulars and the M. R. C. will agree with me that, long before the War Department merged everything into the Medical Corps, U. S. Army, by official fiat, our working agreement and unification had been accomplished, and our seal might in all reason have carried the legend "E Pluribus Enum." It is my thorough conviction that practically every thinking, efficient man who comes back from France carries in his heart a sense of close affiliation with the old Medical Corps and is imbued with a keen desire to help us solve our problems in the future.

No reference to our work in France could be reasonably proper without comment on the nurses, who blazed trails and killed lions with us, quite up in the wilderness. I recall that when I left the L. O. C. there were over 4,000 of them in my area, and any ordinary man may fittingly balk at a dispensation of Providence which gives unto him the super-

vision of 4,000 women. This figure grew to 9,000 and over in December, 1918, when I left France for home, and the gracious bachelor who at present adorns the office of the Chief Surgeon, A. E. F., has had a merry quota of femininity under his aegis.

But this body of women were bent on doing a great work, and they were so busy doing it that they had no time to worry a chief surgeon. I do not think America sent any more resolute spirits to France than she sent in the personnel of the Army Nurse Corps. Their training had taught them the cogent need for discipline and control, and their eagerness to soften the rigors of suffering gave them the inspiration to fight it out to a finish and surmount the untoward conditions under which they had to live and work. The cold, raw early morning and the premature winter night in France, with creature comforts and normal hospital equipment and facilities at a minimum, put no blight on the service rendered the sick man in our hospitals. With mobile hospitals and surgical teams, the only limit set by our nurses to their progress to the front was that imposed by military necessity. They worked in rubber boots, and a chief nurse told me the lingerie of many of these ladies often bore unmistakable earmarks of having been originally issued as pajamas for the sterner sex, sick in hospitals. But our nurse got her sufficient panegyric from the plain soldier man, who was the great beneficiary of her *tactus eruditus*. A trip through any hospital in France showed the youth of the nation bearing the smile of content, coddled by a bustling young woman, who in most cases envied him his wounds and in all instances cherished his best interests as her first and foremost concern.

These women did much for international comity, and many a Tommy or Poilu carried back to his home a grateful recollection of just how much America was willing to do for her allies, because an army nurse had helped him in his crisis of life.

While I am on the subject of the army nurse, I cannot forbear a brief reference to a matter which is as unpleasant and revolting as it is insistent that measures be taken to lay it as one smites the serpent. I hesitate to mention a report which is so malevolently and viciously false, and which should perhaps be consigned to the waste basket, which all decent minds must keep in this time of flagrant gossip. However, I deem it a duty to deny, with all the vehemence I can summon up, the outrageous lie that special maternity hospitals are apportioned in this country for unfortunate women who have been among our nurses in France.

The story even reached me in France, from America, in December, 1917, and it has come to me from several gossip peddlers since my return

to this country. I grieve to say that in every instance women were the agencies of diffusion. I know so well how free we were from just this thing, when I had daily access to all the records in France and England, and the perpetuation of the slanderous story over here prompted me to hunt up the records in the Surgeon General's Office, where every such case must of necessity finally rest. Now please note the emphatic denial made by those records when I tell you that there are just twelve such cases to be found. Only twelve among 11,000 women, living under conditions during nearly two years, of detachment from their ordinary environment, have shown the frailty which is so ruthlessly and ungenerously charged to them. Of course this must die, as all lies must die in time, but those women did so much for America in her hour of need, they did it so nobly and without stint, and it is only a meager requital to them that some one apprised of the truth should proclaim it and come out openly in their defense. I deny the wretched story, and all my running mates in the L. O. C. will share the scorn I feel for the contemptible spirit which spreads it. "Be thou as chaste as ice, yet thou shalt not escape calumny" was written centuries ago.

Let me touch for a moment on the Medical Department enlisted men who put their impress on our work. Without them we could have done nothing of the things we did, and surely we had a fine collection of splendid youngsters to do the countless things a soldier in the department must do. I think I know why we got so many unusual men, and it lies in the fact that voluntary enlistment in the Medical Department insured an early arrival on the other side. I got together forty lawyers, clerks, secretaries, and students for the initial office and supply service and took them with me from New York on July 2, 1917. I like to refer to those chaps as the forty immortals, and they were but the type of the men who came to us in our base hospitals and other units. Later on, the apportionments given the Medical Department at large from the selective draft were not of such good quality, but we had the fine leaven of our organized units to sustain the burden. It is a source of gratification that so many of them received commissions in France. The eight-hour law did not hold with them, and the arrival of the convoy of sick and wounded meant that everything but work—plenty of it—was off the cards.

If the soldier going over the top was doing his bit, the chap who helped get his poor dismembered body out of the ruck, and into a neatly sheeted bed, was doing his, with even consecration. The enlisted man of our department has the love and affection of those who worked with him, and, personally, I count many of them my warm and esteemed friends, who stir my emotions when I see them in the afterglow.

In closing, let me say a word about our allies. We met much kindness from both the French and English. In our very early days we begged the French for hospitals, and they dispossessed their own people to help us. I have a clear vision of an interview between two French officers at Bordeaux in August, 1917; the one holding on to his hospital of 2,500 beds, like a lioness over her cub, and the other ruthlessly and implacably urging the dictum of the Service de Sante, in Paris, that the place was "pour les Americains, tout a fait et immediatment."

The French were good to us and so patient to our insistence.

It was my privilege to serve for five months among the English on their own hearth, and I came away from them sure that they are the kindliest, most helpful people I ever met outside my own land, which by no means holds more of good-will than they do. The setting there was one to harass a chief surgeon when in May, 1918, we began to pour thousands of troops through England and to recover some of our sad, pitiful wreckage from the British lines in Flanders, through Southampton.

The needs of our department in the face of this new-found policy were beyond calculation. We had little material and only a few places worthy of being dignified as hospitals, but we had the stalwart goodwill of a lot of big-hearted Englishmen, who not only listened but acted, and would not say nay to the need of the stranger within their gates. Hospitality which goes beyond giving you dinners and gives you beautiful hospital buildings for your sick is hospitality indeed, and in less than three months we had 7,000 beds going in places which were real hospital finds. Further than this, the open door was ours into any British hospital, and our men met only kindness and skill. I learned to admire British efficiency as I saw men tucked away in our hospitals at Dartford and Portsmouth who, less than forty-eight hours previously, had fallen in the mud of No Man's Land in Flanders, under German shellfire. That was English evacuation of wounded in its highest expression, and it was a masterful system. We Americans owe a great deal to many Englishmen, and to none is our debt more substantial than that we owe to those rare gentlemen, Lieut. Gen. Sir John Goodwin, Director General, Army Medical Service, and Maj. Gen. F. G. Bond, Director of Quartering, at the British War Office. If these gentlemen did not tire of begging Americans, it was because they had an infinity of patience and a boundlessness of the good heart.

I would gladly dwell at length on the hospitality for American medical officers which was ours at the charming home of the ever-delightful Oslers, in Oxford. Sir William and his gracious lady were ever ready to receive and help their former compatriots, and they knew the details of our hospitals, because they went to them and through them. It was

encouraging to go about with the keen and inspiring presence of the beloved "Chief" to point out that the most important place in the hospital was the laboratory! Personally, I elect the kitchen, but I did not tell him so.

And now, gentlemen, let me close my rather rambling, very unscientific and quite commonplace bit of narration by expressing the hope that when again our beloved America knows the hour of stress and calls upon her manhood and womanhood to get into the fray, she may find everywhere as knightly and queenly a response as came to her from the medical and nursing professions in this war. Many of our good people rest in the soil of foreign lands. The casualty reports for the entire A. E. F. to March 31, 1919, show for medical officers: killed in action, 46; died of wounds, 22; died of disease, 102. For nurses: died of disease and accident, 109. For enlisted men: killed in action, 382; died of wounds, 247; died of disease, 1,500.

To the shades of these and to those who abide in the two professions, we of the permanent corps may say with full hearts:

> I have eaten your bread and salt,
> I have drunk your water and wine,
> The deaths that ye died, I have watched beside,
> And the lives that ye lived were mine.

A GRAPHIC METHOD FOR BALANCING THE ARMY RATION[1]

By Captain MERKEL H. JACOBS

Sanitary Corps, United States Army

(With three illustrations)

SURVEYS conducted by the Section of Food and Nutrition, Division of Sanitation, Medical Department of the Army have shown that the food furnished to the enlisted men is generally liberal in quantity. Its average energy value for several hundred messes from many different camps was found to be in the vicinity of 3,600 calories per man per day, an amount slightly greater than that consumed by American farmers. But while the *average* amount is nearly always sufficient, it sometimes happens that a mess that makes a good showing when a ten-day period is considered, fails on the whole to satisfy its men, because on some days, or at some meals, the quantity furnished is excessively high, and on other days or at other meals it is so low that their hunger is not fully appeased. Perhaps the actual injury to the health under these conditions may not be great, but the reverse is certainly true of the effect on the morale of the men.

Furthermore, assuming that the quantity is at all times sufficient, the question of "balance" arises. Examples of poorly balanced diets are not infrequent in the Army. A common defect is the use of quantities of proteins and fats far in excess of the needs of the body. Aside from possible direct nutritional disadvantages of this condition, the indirect effect is that, since proteins and fats are relatively expensive materials, their undue use tends to prevent the purchase from a fixed ration allowance of, for example, fresh fuits and vegetables and to make it difficult in other ways to provide that variety and attractiveness of the diet without which the best results cannot be obtained.

For these reasons it is obviously desirable that mess sergeants and others who have to do with the food of the Army should be able to prepare daily bills-of-fare that will be adequate without being wasteful, and at the same time properly balanced with respect to their various constituents. Unfortunately, in practice, the bal-

[1] From the Section of Food and Nutrition, Division of Sanitation, Medical Department, U. S. A.

ancing of the diet is a problem of some difficulty. Tedious numerica calculations consuming much time are required, and, in addition, the average mess sergeant lacks the proper theoretical scientific background for such work. The introduction of the methods in common use into army messes under existing conditions, therefore, can hardly be considered practicable.

To meet these difficulties, a graphic method has been devised which has the following advantages over the method in ordinary use: (1) It requires no previous acquaintance with the use of the terms, *caloric, protein,* etc., though, of course, such knowledge is desirable. (2) The results are quantitative, but no calculations are necessary, a ruler and a pair of dividers giving the necessary accuracy. (3) The nature of each article of food dealt with can be seen at a glance with a vividness not possible where numbers alone are employed. It is believed that the use of the method for a short time will give to the person using it a familiarity with the properties of the different articles of food that could scarcely be obtained in any other way. (4) In building up a day's bill-of-fare, the exact contribution made by each article of food to the end result is clearly apparent at all times, and the choice of the proper dishes to bring about any desired result is extremely easy. (5) The method is useful not only in constructing balanced menus, but in determining quantitatively how much any given menu is "out of balance." (6) The cost of each individual food material is readily seen, as well as that of a menu at all stages of its construction, and opportunity is given to select such articles as will give the desired food value without exceeding a given cost.

The general principle of the method is to represent the energy, protein, and fat content of a definite amount of food by the length of three parallel lines whose ends are joined, giving a figure whose shape is characteristic for the food in question. In combining different articles, the lengths of these lines are simply added by means of a pair of dividers, and the end result is obtained by measuring with a ruler the total distances resulting from this summation. The chief point of originality about the construction of the figures is that a different scale is chosen for each of the three parallel lines so that the distance representing a given number of calories and the amounts of protein and fat thought appropriate to this amount of energy are equal in length, giving a horizontal line as the upper boundary of the figure when a perfect balance is present, and an upward or a downward slope, as the case may be, if there is an

excess or deficiency of one of the constituents. The standard here chosen as representing a condition of "balance" is sufficient protein to supply about 12½ per cent and sufficient fat to supply about 25 per cent of the total energy. With a daily allowance of 3,600 calories this would amount to 110 grams of protein and 97 grams of fat a day. These amounts are more than adequate for the needs of the body, though somewhat less than those at present consumed in actual army practice. Naturally, any other desired standard could be employed equally well without changing the principle of the method.

In Fig. 1 is represented graphically the "balance" of a few typical articles of food. The portions chosen are in each case 0.1 pound; for some other articles of very low food value 1-pound portions would be preferable, and for certain other purposes 100-calorie portions might be useful. The figures have been reduced in size for reproduction, but in actual use the scales for the three lines are: For the left hand or energy line 1 cm.=100 calories, for the middle or protein line 1 cm.=3.05 grams, and for the right hand or fat line 1 cm.=2.69 grams. The shapes of the figures are characteristic of the food materials they represent, and it will be noticed that even a glance at them gives much information about the properties of the articles in question.

The horizontal dotted lines in each case are the "cost lines." Their distance from the base line in centimeters is equal to the cost in cents of the amount of material represented by the figure. A considerable amount of information of value can be obtained from the position of the cost line. For example, if its height is the same as the length of the line representing calories, the food supplies 100 calories for one cent. If its height is twice as great, the energy furnished would be 50 calories for one cent, etc. The relation of the protein and fat levels to the cost line also shows at a glance whether or not the food is a cheap source of these materials.

For the simple ingredients such as milk, flour, butter, etc., that enter into the various dishes served, it is well to have as a basis for further work a set of figures similar to the samples given in Fig. 1. In actual practice in army messes it would be well to have prepared sets of blueprints which could be duplicated any desired number of times. To facilitate the construction of such figures there is given in Appendix 2 a table of food analyses prepared by Major Milner for the section of Food and Nutrition, Division of Sanitation, Medical Department, U. S. A., of the articles most

commonly used in army messes. To this table has been appended in the last three columns the length in centimeters of the energy, protein, and fat lines respectively to be used in constructing graphic representations of 0.1-pound portions of the various articles.

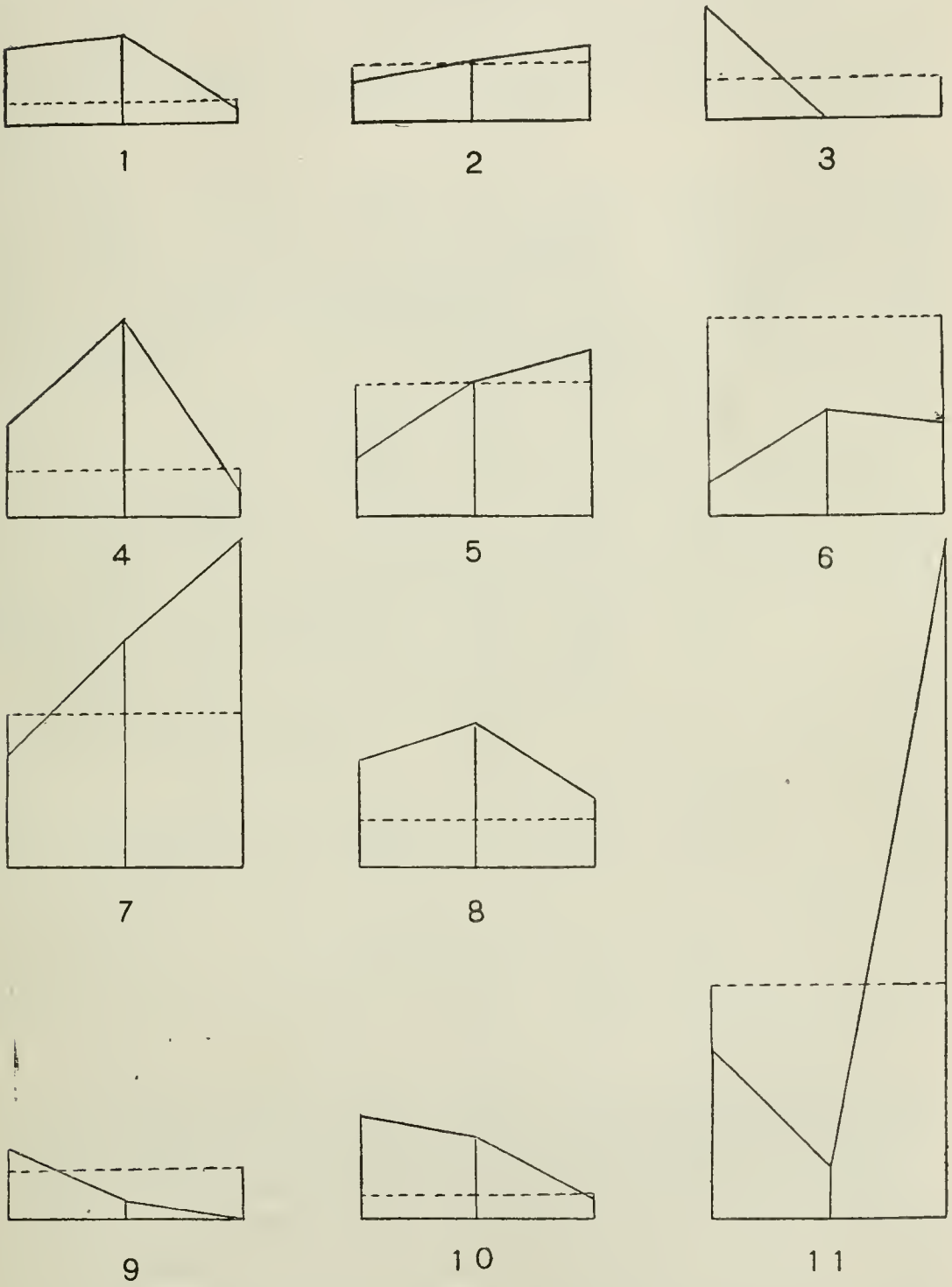

FIG. 1.—Graphic representations of the "balance" and cost of 0.1-pound portions of a number of common articles of food as follows: (1) Bread; (2) milk; (3) sugar (4) beans (dried); (5) beef, as purchased; (6) eggs; (7) cheese; (8) oatmeal; (9) prunes; (10) cornmeal; (11) bacon.

For practical purposes, it saves much time and is usually sufficiently accurate to work with figures representing average servings of the various completed dishes instead of dealing with each constituent separately. These figures for the more complicated dishes

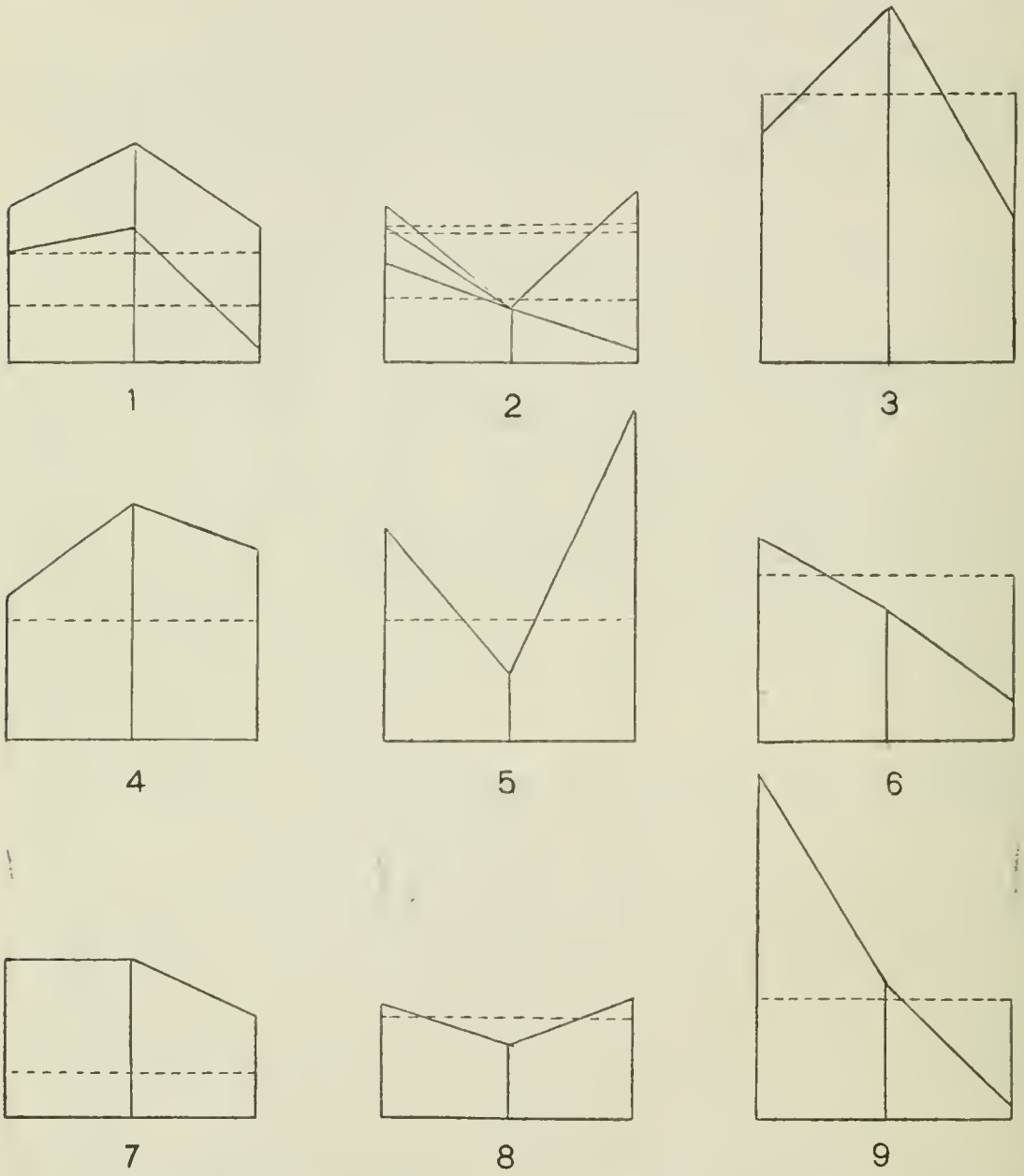

Fig. 2.—Graphic representations of the "balance" and cost of standard one-man portions of a number of dishes according to the Manual for Army Cooks: (1) Macaroni and cheese; (2) candied sweet potatoes; (3) lima beans (with bacon); (4) bean soup; (5) apple pie; (6) rice pudding; (7) corn bread; (8) mashed potatoes; (9) buckwheat cakes with sirup (no butter).

are built up from those of their various ingredients by adding together on three parallel lines the proper amounts of energy, protein, and fat, respectively, from the materials composing them and completing the figure in the manner already described. In Fig. 2 are

represented some typical standard portions according to the recipes in the Manual for Army Cooks. In the first two the method of construction is shown. In order to plan approximately balanced menus these one-man portions may be employed; whenever greater accuracy is desired, the 0.1-pound figures can be resorted to. It is convenient in the latter figures, if great accuracy is required, to have the energy, protein, and fat lines divided into tenths, though anyone with a little practice can learn to estimate the length of portions of a line with a sufficient degree of accuracy for most purposes.

Having a collection of figures for standard portions of the more usual dishes and for tenth-pound portions of the simple articles used in their preparation, it becomes an extremely simple matter either to construct a balanced menu or to test the balance of one already on hand. A sheet of paper approximately 8 by 60 cm. is ruled with three parallel lines the length of the paper. On them are plotted one by one the dishes entering into the day's bill-of-fare. The general method to be followed is shown in Fig. 3. The balance at every step is easily seen, and the number of calories can be obtained at any time by simply measuring the distance in centimeters of the point reached on the calorie line from the starting point. By treating the horizontal cost lines in the same way, the total cost in cents at any stage of the process may be obtained.

It is well in planning a bill-of-fare for the day to decide on the number of calories desired for each of the three meals and to draw horizontal lines at the proper levels to serve as guides in constructing the menus. If, for example, it is desired to furnish 3,600 calories distributed as follows: breakfast, 1,200; dinner, 1,300; supper, 1,100, horizontal lines would be drawn at distances of 12, 25, and 36 cm. from the base line and such dishes used for each meal as to furnish the proper total. A dotted horizontal line may also be drawn at the level representing the ration allowance; it is then easy, by choosing the proper dishes, to keep the cost for the day below this point.

In using the method, other applications will readily suggest themselves; those mentioned are merely some of the most important. There are added two appendices, one outlining a suggested method of presenting the subject as simply as possible to mess sergeants, and the other giving data from which figures showing the "balance" of the different articles of food most used in army messes may readily be constructed.

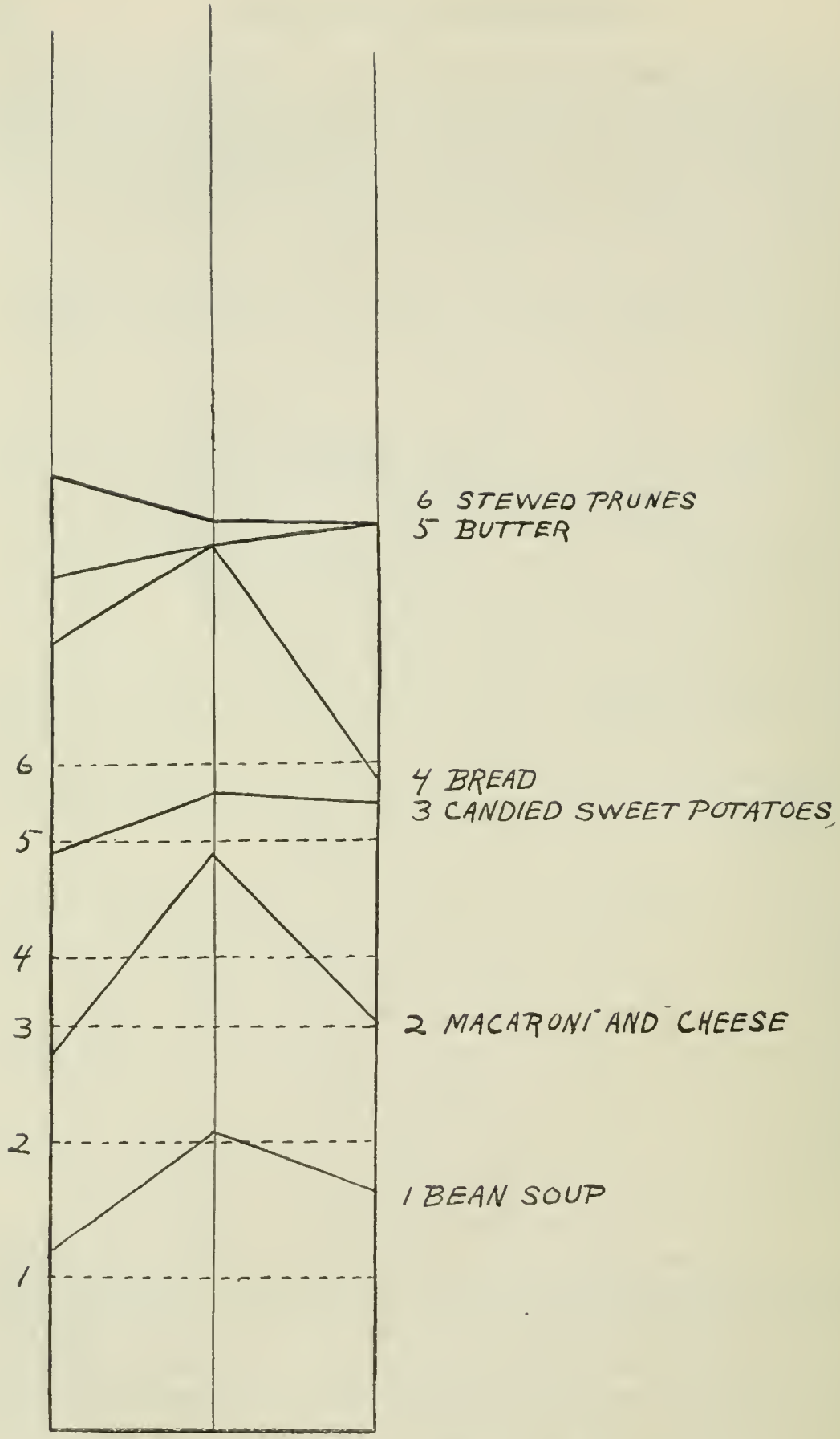

FIG. 3.—METHOD OF CONSTRUCTING A MENU.

A meatless, balanced meal furnishing 1,200 calories for 8.3 cents.

Appendix 1.—Instructions to Mess Sergeants for Using a New Method of Balancing Menus

I. INTRODUCTION

In planning a bill-of-fare for a day, or even a menu for a single meal, a mess-sergeant should be able properly to regulate two things: (1) the amount of energy furnished by the food, and (2) the proportions or "balance" of the different substances which compose it.

As to the former, the energy value of a food is much like the heat value of a fuel, and, like it, may be measured in units called calories. It should be your aim to supply neither too large nor too small a number of calories. If the number is too large, food is unnecessarily wasted, and the digestive and other organs of the body are given too much work to do; if the number is too small, loss of body weight occurs, which, if long continued, is dangerous. The proper daily allowance for a soldier under ordinary conditions is usually between 3,200 and 4,000 calories; in a permanent camp 3,600 calories may be taken as a fair average figure. A good division of the daily total between the three meals would be: Breakfast, 1,200; dinner, 1,300; and supper, 1,100 calories, respectively, though other equally good arrangements are possible. It is not necessary that exactly 3,600 calories should be given every day, but only that the average for a period of a number of days should be in this vicinity. If this is the case, the number on any one day may with no particular disadvantage be 200 or 300 calories either above or below the figure given.

With regard to the "balance" of the menu, the chief points to be considered are the relative quantities of protein, fat, and carbohydrate furnished. All three of these classes of substances are represented in various proportions in most of the common food materials. Bread, for example, is composed of 10 per cent protein, 1 per cent fat and 58 per cent carbohydrate, the remainder being chiefly water. As examples of materials especially rich in protein may be mentioned lean meat and white of egg; materials rich in fat are butter, lard, bacon, peanut butter, etc.; rich in carbohydrate, sugar, cornstarch, rice, flour, and cereal products in general. The attempt should be made, by proper combinations of the food materials, to supply these three classes of substances in favorable proportions. If the proportions are not correct, the food is likely to be either unwholesome or unnecessarily expensive, or both. For

example, too much protein greatly increases the cost of the food and, in addition, is possibly injurious to the health, while too little causes loss of body weight and eventually, if sufficiently long continued, death. Likewise, too much fat makes the food more expensive and interferes with digestion, while too little makes the food less "satisfying" and less palatable. Experience has shown that a favorable proportion for army messes is 0.11 ounce of protein and 0.09 ounce of fat for every 100 calories, the remainder of the energy coming from carbohydrate. This would amount for one day's supply of 3,600 calories to 3.9 ounces of protein, 3.4 ounces of fat, and 19.36 ounces of carbohydrate. If protein, fat, and total energy are taken into account, carbohydrate need not be, since it furnishes that part of the total energy that does not come from protein and fat.

There are several methods of planning menus to give the proper number of calories and the correct amounts of protein and fat. The one usually employed requires troublesome numerical calculations and is not of so much use in preparing menus as in testing them out when they have been made up. The method here described is much less troublesome to use, is sufficiently accurate for practical purposes, and is especially useful in the work of actually planning menus in advance. In place of numerical calculations, measurements of lines are used, and the "balance" of the food is shown by the shape of a geometrical figure. The only materials required are a set of blue-print figures representing graphically the properties of the various foods, and a ruler divided into centimeters and tenths of a centimeter (millimeters). A pair of dividers is useful, but not absolutely necessary.

II. DIRECTIONS FOR USING THE METHOD

1. Examine the first set of blue-prints. Each one represents an average one-man portion of some dish or article of food *according to the recipes in the Manual of Army Cooks.* The left-hand vertical line stands for the energy furnished by such a portion, the scale being such that one centimeter stands for 100 calories. The energy value of a standard serving of any of the dishes represented may immediately be determined by measuring this line. For example, in the figure for macaroni and cheese it is 2.5 cm. long; therefore a standard serving of this dish would furnish 250 calories.

PROBLEM 1.—Before going farther, take your ruler and by measurement pick out three dishes which furnish less than 100 calories, three which

furnish between 100 and 200, and three which furnish over 300. Which of the standard servings represented furnishes the most energy? Which the least?

2. Now examine the shape of the figures. The middle line stands for protein and the right-hand one for fat. The shape of the top of the figure clearly depends on the length of these lines. The scales for the three lines are so chosen that one centimeter on the protein line represents 0.11 ounce and one centimeter on the fat line 0.09 ounce. When they are equal in length, therefore, the food is perfectly balanced, since these are the amounts considered proper for each 100 calories. When either the protein or fat line is longer than the energy line, there is more protein or fat, as the case may be, than is desirable; when either of these lines is shorter, there is less than is desirable.

Problem 2.—Before going any further, look over all of the figures and make a list of three articles that have an excess of protein and a deficiency of fat, three which have a deficiency of protein and an excess of fat, three which have an excess of protein and an excess of fat, and three which have a deficiency of protein and a deficiency of fat.

3. When you can quickly and easily recognize the properties of any article from the shape of its figure, proceed as follows to determine the results of combining two or more articles. Draw on a piece of paper three parallel vertical lines about 2 cm. apart. Draw across their lower ends a horizontal base line to serve as a starting-point. Suppose now you wish to determine the result of combining a serving of macaroni and cheese and one of candied sweet potatoes. With a pair of dividers (or if you have no dividers, with a ruler, or even by making marks on a piece of paper) obtain the length of the left-hand "energy line" for the first dish. Mark off the same distance on the corresponding line which you have just drawn. Then do the same thing for the protein and the fat lines. Connect the points you have marked off and you have a duplicate of the blue-print figure for macaroni and cheese. Next take the figure representing candied sweet potatoes and proceed in exactly the same way except that you start from the points already reached on the three lines instead of from the base line. Complete the figure in the usual way and at a glance you can see to what extent the combination is a balanced one. In this particular case there is a slight deficiency in protein and a somewhat smaller deficiency in fat, but the balance on the whole is good. A measurement of the point

reached on the energy line shows that it is 5.0 cm. distant from the base line, indicating 500 calories. We may conclude, therefore, that a standard serving of macaroni and cheese, together with a standard serving of candied sweet potatoes, would furnish a well-balanced combination having a food value of 500 calories.

PROBLEM 3.—Determine the number of calories furnished and the balance of the following combination: (*a*) beef stew and baked beans; (*b*) sausage and buckwheat cakes; (*c*) lima beans and apple pie; (*d*) bean soup and fried potatoes.

4. Now try combining three or four articles in exactly the same way, choosing them so as to give as perfect a balance as possible. An excess of protein in one should be balanced by a deficiency of protein in another, etc.

PROBLEM 4.—Make up three combinations of at least three articles each that approximately balance. Would it as a rule be a good thing to serve pork chops, fried potatoes, and cocoanut pie at the same meal?

5. If, instead of the standard portions given, it is desired to use smaller or larger portions, this can readily be done by changing the lengths of the lines. If, for example, it is desired to give only half of the standard portion, take half of the length of each line; if three-quarters, take three-quarters of their length, etc. With a little practice, any desired subdivision of the lines can be made by eye with sufficient accuracy. Particularly in the case of bread, butter, sugar, jam, etc., it is desirable not to use fixed portions, but to use whatever quantities are necessary to supplement and balance the main dishes of the meal.

PROBLEM 5.—Take an unbalanced combination of several dishes having a deficiency of energy and fat, and bring it to a balance by using the proper quantities of the above-mentioned articles.

6. If any of the recipes used in your mess differ greatly from those of the Manual for Army Cooks, it will be necessary to construct figures for them corresponding to those already given. This may be easily done from the second set of blue-print figures which represent 0.1-pound portions of the chief articles used in the preparation of the more complicated dishes. The method is the same in principle as that already used, each dish being built up from the proper amounts of its constituent articles.

PROBLEM 6.—Take several receipes used in your mess which are not given in the Manual for Army Cooks, and construct figures for a standard serving of each of them.

Problem 7.—Now construct an approximately balanced bill-of-fare for a day, which will furnish in the vicinity of 3,600 calories properly divided between the three meals. Also test out several old bills-of-fare from your mess and determine their defects with respect to total energy furnished, its distribution between the three meals, and balance.

7. In the construction of bills-of-fare, be sure to include some fruit (fresh or dried) and fresh vegetables. These articles do not make much of a showing with respect to calories furnished, but are very important in adding to the wholesomeness of the diet. A safe rule is to use every day, if at all possible, at least one fresh or dried fruit and one fresh vegetable in addition to potatoes.

8. If desired, the cost may be shown by means of a horiozntal dotted line whose distance from the base line in centimeters represents the cost of the amount of material in question in cents. If a standard serving of macaroni and cheese has its cost line 1.7 cm. from the base line, it costs 1.7 cents. When two or more dishes are combined, the distances of the cost lines are added and the distance in centimeters of the last line from the base line gives the cost of the combination in cents. The method to be followed is shown on the last page of the blue-prints, where a simple balanced menu is built up from standard servings of a number of dishes. Since the prices of food materials are constantly changing, it will usually be necessary for the mess sergeant to supply his own cost lines. Those here given are merely intended as illustrations.

Problem 8.—Work out the position of the cost line for a number of the standard servings shown in the blue-prints, and then determine the cost of several of the combinations you have made.

9. The use of this method a few minutes a day in planning menus and in testing out those already on hand will in a short time give you such a familiarity with the properties of the chief dishes used that you will unconsciously and without effort make correct combinations and will finally need only on special occasions to go through the work as here outlined. In conclusion, it may be pointed out that it is not necessary to follow slavishly the exact quantities and proportions indicated, but an effort should be made, in the long run, at least to approximate them. If this is done, the food will probably be improved in wholesomeness and palatability, and unnecessary waste of the valuable proteins and fats will be avoided.

Appendix 2—Articles Commonly Used in Army Messes Showing Quantities of Nutritive Constituents and Energy Per Pound of Food Material[1]

In the last three columns are given in centimeters the lengths of the lines to be used in representing graphically the energy, protein, and fat, respectively, in a 0.1-pound portion.

	Protein	Fat	Carbohydrate	Fuel value	Protein	Fat	Carbohydrate	Energy line	Protein line	Fat line
	lb.	*lb.*	*lb.*	*cals.*	*gr.*	*gr.*	*gr.*	*cm.*	*cm.*	*cm.*
Apple butter	.004	....	.379	712	2	...	172	.71	.07	...
Apples, canned	.002	....	.173	326	1	...	79	.33	.03	...
Apples, dried	.016	.022	.661	1,352	7	10	300	1.35	.23	.37
Apples, fresh, E. P.[2]	.004	.005	.142	293	2	2	64	.29	.07	.07
Apples, fresh, A. P.	.003	.003	.108	219	1	1	49	.22	.03	.04
Apricots, canned	.009	....	.173	339	4	...	79	.34	.13	....
Apricots, dried	.047	.010	.625	1,292	21	5	284	1.29	.69	.19
Asparagus, canned	.015	.001	.028	84	7	1	13	.08	.23	.4
Bacon, E. P.	.068	.738	....	3,239	31	335	...	3.24	1.02	12.46
Bacon, A. P.	.062	.679	....	2,979	28	308	...	2.98	.92	11.46
Bananas, E. P.	.013	.006	.220	459	6	3	100	.46	.20	.11
Bananas, A. P.	.008	.004	.143	298	4	2	65	.30	.13	.07
Beans, canned	.069	.025	.196	598	31	11	89	.60	1.02	.41
Beans, dried	.225	.018	.596	1,603	102	8	270	1.60	3.34	.30
Beans, string canned	.011	.001	.038	95	5	1	17	.10	.16	.04
Beef, dried	.392	.054	....	957	178	25	...	.96	5.84	.93
Beef, fresh, E. P.	.185	.200	....	1,188	84	91	...	1.19	2.76	3.38
Beef, fresh, A. P.	.157	.170	....	1,009	71	77	...	1.01	2.33	2.86
Beef, corned, canned	.260	.081	....	825	118	37	...	.83	3.87	1.38
Beets, E.P.	.016	.001	.097	214	7	1	44	.21	.23	.04
Beets, A. P.	.013	.001	.077	172	6	1	35	.17	.20	.04
Brains, beef	.088	.093	....	551	40	42	...	.55	1.31	1.56
Bread, hard	.111	.050	.742	1,797	50	23	337	1.80	1.64	.86
Bread, soft	.100	.010	.580	1,300	45	5	263	1.30	1.48	.19
Breakfast foods	.110	.010	.770	1,679	50	5	349	1.68	1.64	.19

Butter	.010	.820	....	3,478	5	372	...	3.48	.16	13.84
Cabbage, E. P.	.016	.003	.056	147	7	1	25	.15	.23	.04
Cabbage, A. P.	.014	.002	.048	124	6	1	22	.12	.20	.04
Cabbage, pickled	.017	.005	.038	123	8	2	17	.12	.26	.07
Carrots, E. P.	.011	.004	.093	210	5	2	42	.21	.16	.07
Carrots, A. P.	.009	.002	.074	163	4	1	34	.16	.13	.04
Catsup	.015	.002	.123	266	7	1	56	.27	.23	.04
Celery, E. P.	.011	.001	.033	86	5	1	15	.09	.16	.04
Celery. A. P.	.009	.001	.026	70	4	1	12	.07	.13	.04
Cheese, American	.259	.337	.024	1,948	118	153	11	1.95	3.87	5.69
Cherries, canned	.011	.001	.211	417	5	1	96	.42	.16	.04
Chicken, E. P.	.193	.163	....	1,048	88	74	...	1.05	2.89	2.75
Chicken, A. P.	.137	.123	....	774	62	56	...	.77	2.03	2.08
Chocolate	.129	.487	.303	2,858	59	221	137	2.86	1.94	8.22
Cocoa	.216	.289	.377	2,322	98	131	171	2.32	3.22	4.87
Corn, canned	.028	.012	.190	456	13	5	86	.46	.43	.19
Corn, green, E. P.	.031	.011	.197	470	14	5	89	.47	.46	.19
Corn, green, A. P.	.012	.004	.077	182	5	2	35	.18	.16	.07
Cornmeal	.092	.019	.754	1,654	42	9	342	1.65	1.38	.33
Cornstarch	....	....	.900	1,674	...	...	408	1.67	....	....
Crackers (all kinds)	.107	.088	.719	1,908	49	40	326	1.91	1.61	1.49
Currants, dried	.024	.017	.742	1,496	11	8	337	1.50	.36	.30
Eggs, E. P.	.134	.105	....	692	61	48	...	.69	2.09	1.78
Eggs, A. P.	.119	.093	....	614	54	42	...	.61	1.77	1.56
Fish, salmon, canned, E. P.	.218	.121	....	916	99	55	...	.92	3.25	2.04
Fish, salmon, canned, A. P.	.195	.075	....	679	89	34	...	.68	2.92	1.27
Fish, cod, fresh, E. P.	.165	.004	....	324	75	2	...	.32	2.46	.07
Fish, cod, fresh, A. P.	.084	.002	....	165	38	1	...	.17	1.25	.04
Fish, mackerel, fresh, E. P.	.191	.071	....	655	87	32	...	.66	2.85	1.19
Fish, herring, fresh, A. P.	.107	.040	....	368	49	18	...	.37	1.61	.66
Fish, salt, cod, E. P.	.254	.003	....	485	115	1	...	.49	3.77	.04
Fish, salt, cod, A. P.	.190	.004	....	370	87	2	...	.37	2.86	.07
Fish, salt, mackerel, E. P.	.211	.226	....	1,346	96	103	...	1.35	3.15	3.83
Fish, salt, mackerel, A. P.	.163	.174	....	1,037	74	79	...	1.04	2.43	2.94

[1] Prepared (with the exception of the last three columns) for the Section of Food and Nutrition, Division of Sanitation, Medical Department, U. S. A., by Major Milner.

[2] E. P. means "edible portion." A. P. means "as purchased."

	Protein	Fat	Carbo-hydrate	Fuel value	Protein	Fat	Carbo-hydrate	Energy line	Protein line	Fat line
Fish, smoked haddock, E. P.	.233	.002	....	442	106	1	...	.44	3.48	.04
Fish, smoked haddock, A. P.	.157	.001	....	298	72	1	...	.30	2.36	.04
Fish, smoked herring, E. P.	.369	.158	....	1,353	167	72	...	1.35	5.48	2.68
Fish, smoked herring, A. P.	.205	.088	....	752	93	40	...	.75	3.05	1.49
Flour	.114	.010	.751	1,651	52	5	341	1.65	1.71	.19
Grape fruit, E. P.	.006	.001	.122	239	3	1	55	.24	.10	.04
Grape fruit, A. P.	.004	.001	.089	172	2	1	40	.17	.07	.04
Grape juice	....	....	.150	279	...	...	68	.28		
Ham, E. P.	.138	.350	....	1,733	63	159	...	1.73	2.07	5.91
Ham, A. P.	.122	.308	....	1,526	55	140	...	1.53	1.80	5.20
Ham, minced	.221	.206	....	1,280	100	93	...	1.28	3.28	3.46
Hash	.143	.030	.075	532	65	14	34	.53	2.13	.52
Hominy, dried	.077	.009	.783	1,638	35	4	355	1.64	1.15	.15
Hominy, lye canned	.022	.002	.178	380	10	1	81	.38	.33	.04
Ice cream, best commercial	.025	.151	.182	1,022	11	69	87	1.02	.36	2.56
Ice cream, army recipe	.058	.051	.333	942	26	23	151	.94	.85	.86
Jam	.010	....	.600	1,135	5	...	272	1.14	.16	
Lamb, E. P.	.176	.231	....	1,302	80	105	...	1.30	2.62	3.90
Lamb, A. P.	.141	.187	....	1,051	64	85	...	1.05	2.10	3.16
Lard and substitutes	....	1.000	....	4,218	...	454	...	4.22	....	16.88
Lemons, E. P.	.010	.007	.085	206	5	3	39	.21	.16	.11
Lemons, A. P.	.007	.005	.059	144	3	2	23	.14	.10	.07
Lettuce, E. P.	.012	.003	.029	89	5	1	13	.09	.16	.04
Lettuce, A. P.	.010	.002	.025	74	5	1	11	.07	.16	.04
Liver, calf's, A. P.	.190	.053	.014	603	86	24	6	.60	2.82	.89
Macaroni	.134	.009	.741	1,665	61	4	336	1.67	2.00	.15
Milk, evap	.071	.078	.096	640	32	35	44	.64	1.05	1.30
Milk, fresh	.033	.035	.050	302	15	16	23	.30	.49	.60
Milk, skimmed, powder	.354	.012	.481	1,604	160	5	218	1.60	5.24	.19
Mutton, E. P.	.155	.321	....	1,642	70	146	...	1.64	2.30	5.43
Mutton, A. P.	.125	.260	....	1,329	57	118	...	1.33	1.87	4.39
Oatmeal (rolled oats)	.167	.073	.662	1,850	76	33	300	1.85	2.49	1.23
Oil, salad	....	1.00	....	4,218	...	454	...	4.22	....	16.88

Oleomargarine	.008	.867	....	3,672	4	393	...	3.67	.13	14.61
Olives, E. P.	.011	.276	.116	1,400	5	125	53	1.40	.16	4.65
Olives, A. P.	.008	.202	.085	1,025	4	92	39	1.03	.13	3.42
Onions, E. P.	.016	.003	.099	226	7	1	45	.23	.23	.04
Onions, A. P.	.014	.003	.089	204	6	1	40	.20	.20	.04
Oranges, E. P.	.008	.002	.116	239	4	1	53	.24	.13	.04
Oranges, A. P.	.006	.001	.085	173	3	1	39	.17	.10	.04
Peaches, canned	.007	.001	.108	218	3	1	49	.22	.10	.04
Peaches, dried	.047	.007	.626	1,281	21	3	284	1.28	.69	.11
Peanut butter	.293	.465	.171	2,824	133	211	78	2.82	4.36	7.84
Pears, canned	.003	.003	.180	353	1	1	82	.35	.03	.04
Peas, green, canned	.036	.002	.098	258	17	1	45	.26	.56	.04
Peas, dried	.246	.010	.620	1,653	112	5	281	1.65	3.67	.19
Pineapple, canned	.004	.007	.364	714	2	3	165	.71	.07	.11
Pork, fresh:										
Ham and shoulders, E. P.	.126	.423	....	2,019	57	192	...	2.02	1.87	7.14
Ham and shoulders, A. P.	.104	.350	....	1,670	47	159	...	1.67	1.54	5.91
Loin, E. P.	.158	.306	....	1,585	72	139	...	1.59	2.36	5.17
Loin, A. P.	.114	.222	....	1,148	52	101	...	1.15	1.70	3.75
Pickles, cucumber	.005	.003	.027	72	2	1	12	.07	.07	.04
Pork, salt, E. P.	.081	.725	....	3,209	37	329	...	3.21	1.21	12.23
Pork, salt, A. P.	.074	.665	....	2,943	34	302	...	2.94	1.11	11.23
Potatoes, sweet, E. P.	.018	.007	.274	573	8	3	124	.57	.26	.11
Potatoes, sweet, A. P.	.014	.006	.219	459	6	3	99	.46	.20	.11
Potatoes, sweet, canned	.019	.004	.414	822	9	2	188	.82	.30	.07
Potatoes, white, E. P.	.022	.001	.184	387	10	1	84	.39	.33	.04
Potatoes, White, A. P.	.018	.001	.147	311	8	1	67	.31	.26	.04
Prunes, E. P.	.021	....	.733	1,402	10	...	333	1.40	.33	....
Prunes, A. P.	.018	....	.622	1,190	8	...	282	1.19	.26	....
Pumpkin, canned	.008	.002	.067	148	4	1	30	.15	.13	.04
Raisins	.023	.030	.685	1,443	10	14	311	1.44	.33	.52
Rice	.080	.003	.790	1,631	36	1	358	1.63	1.18	.04
Sausage, beef	.189	.192	....	1,161	86	87	...	1.16	2.82	3.23
Sausage, pork	.130	.442	....	2,106	59	201	...	2.11	1.94	7.47
Sirup	....	....	.710	1,321	...	...	322	1.32	....	....
Spaghetti	.121	.004	.763	1,661	55	2	346	1.66	1.80	.07
Spinach	.021	.003	.032	111	10	1	15	.11	.33	.04
Squash, canned	.009	.005	.105	233	4	2	48	.23	.13	.07

	Protein	Fat	Carbo-hydrate	Fuel value	Protein	Fat	Carbo-hydrate	Energy line	Protein line	Fat line
Sugar	....	....	1.000	1,860	...	...	454	1.86	....	....
Tallow	....	.800	....	3,374	...	353	...	3.37	....	13.12
Tapioca	.004	.001	.880	1,648	2	1	399	1.65	.07	.04
Tomatoes, canned	.012	.002	.040	105	5	1	18	.11	.16	.04
Tomatoes, fresh, A. P.	.009	.004	.039	106	4	2	18	.11	.13	.07
Turkey, E. P.	.211	.229	....	1,358	96	104	...	1.36	3.14	3.87
Turkey, A. P.	.161	.184	....	1,076	73	84	...	1.08	2.39	3.12
Turnips, E. P.	.013	.002	.081	183	6	1	37	.18	.20	.04
Turnips, A. P.	.009	.001	.057	127	4	1	26	.13	.13	.04
Veal, E. P.	.207	.067	....	668	94	30	...	.67	3.08	1.12
Veal, A. P.	.183	.058	....	585	83	26	...	.59	2.72	.97

A SUGGESTION IN REGARD TO AMPUTATION CASES

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IN MAKING a study of balance-board exercises with special reference to faulty statics of the foot and leg, we have concluded that in most cases of relaxed postures and weak feet the usual Swedish balance-board exercises are harmful. We feel that the very best agent for repair of weakened structures is active exercise, but, if satisfactory results are to be obtained, these activities must be in the proper dosage and with the foot held in a corerctive position.

It is axiomatic in orthopedic practice that not only must weakened structures be strengthened in order to control movement in the direction opposite to that of the deforming forces, but that deforming forces, such as shortened muscles and ligaments and the force of gravity, must be rendered ineffective. For example, relaxation of the structures on the inner border of the foot allows gravity to force it downward; at the same time there is a compensatory shortening of the chief outside guy wires of the leg whose main function is to evert and abduct the foot. To correct this condition of faulty statics, balance exercises are very beneficial, provided the foot is not carried inward under the middle line of the body, as necessitated by the use of the Swedish balance-board. This difficulty we have overcome by the use of a tilted balance-board described in a previous article published in the *Boston Medical and Surgical Journal.* The very same principle applies to the use of the tilted heel, which necessitates activity with the inner border of the foot raised. This shortens the inner structures and lengthens those on the outer border.

The appreciation of secondary deformities in unilateral foot and leg cases is very frequently overlooked until definite injury has been done by the development of secondary faults. It frequently happens that flat foot, with its accompanying faulty statics, will be produced in the right leg after the left leg has been paralyzed or injured. If a little forethought had been used and proper prophylactic measures instituted, this condition would not have developed.

It has recently been my privilege to visit some of the Canadian reconstruction hospitals. My observation there of one-legged men, not yet fitted with artificial limbs, brought to my mind the fact

that practically all of them were using the remaining foot in a marked position of valgus. I saw at once the parallelism between their foot position and that assumed by a person standing on a Swedish balance-board. Because of the necessarily increased load on the one foot the balance strain is greatly increased. The foot, being carried under the middle line of the body, is thrown in a valgoid position and, in consequence, the peronei and outer leg structures must shorten adaptively. The continued use of the overburdened foot in this position will of necessity do harm. As many months must elapse before the cases whose stumps are sensitive or still draining may be fitted to a prosthetic appliance, it is easy to see how the long-continued use in a harmful position might result in the development of a broken arch.

With the arch depression due to the relaxation of the inner foot structures, the leg is more strongly rotated inward than is usually seen in an uninjured individual with weak feet. In walking, this condition is markedly increased by the peculiar outward thrust of the pelvis over the weight-bearing leg, especially in those using one crutch. This increases both the lateral and the rotation strain which must be borne by all the leg structures, especially by the joint linings on the hip, knee and ankle. To guard against this condition we would urge attention to prophylactic measures, chief among which is the use of a tilted heel with a rise on the inner border from one-fourth to one-half inch in accordance with the stability of the foot and the weight of the individual; also such other measures as are used in foot strain cases as contrast baths and foot exercises. There are three exercises that are of most value:

1. Rotation of the thigh outward with the toes gripping the ground, preferably with the patient leaning against the wall on the side that has lost the limb. This will allow the good leg to be held in a more normal attitude. In case the foot is already flat, it is not advisable to exercise it at first while bearing weight; instead it is best done while lying prone with the leg extended, the foot projecting from the end of the table or couch. An assistant grasps the foot, holding it in a toe-in position; the patient then twists the leg in the opposite direction, tightening all the external group of the thigh and pelvis. It would be advisable for him to use the muscles as though he possessed two legs. This greatly aids in keeping up the nutrition and development of the gluteal and thigh muscles of both sides.

2. Patient seated, the foot is strongly adducted, dorsi flexed, and toes plantar flexed; done in three counts, strongly and forcibly.

3. Toe-gripping exercise, or picking up marbles with the toes.

These exercises may be started from five to ten times and gradually increased one count a day until they are done forty or fifty times. It is very essential that the disabled man be taught to safeguard his usefulness in this way.

STATISTICAL STUDY OF THE PREVALENCE OF INTESTINAL WORMS IN 35,000 WHITE AND COLORED TROOPS AT CAMP ZACHARY TAYLOR, KENTUCKY[1]

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THE PRESENT investigation was undertaken, first, to determine the prevalence of intestinal worms among southern troops at this camp, and, secondly, to study the much disputed question of racial influence in this connection. Over 35,000 soldiers were examined; of these 26,672 were white, 8,653 colored. All the white soldiers were residents of Kentucky; 6,948 colored soldiers came from Kentucky, 865 from Alabama, and 840 from Tennessee. Practically all were between 18 and 42 years of age and in good physical condition. It must be emphasized that these men were soldiers on active service and presumably in good health; therefore, only men showing no appreciable signs of disease were examined.

SUMMARY OF PREVIOUS WORK

While a number of careful hookworm surveys are on record, very few American studies on the prevalence of intestinal worms in general are available. Extensive data on the incidence of hookworm have been published by Ashford, King, and Igaravides (Porto Rico), by the Rockefeller Commission and by boards of health of several southern states. Recent studies on hookworm in the Army have been published by Keilty, Havercamph and Trabue, and by Frick. Reports on helminthiasis in general have been chiefly the work of Stiles and Garrison, and their associates of the United States Public Health and Marine Hospital Service, who examined 3,457 inmates of the Government Hospital for the Insane, the Connecticut Hospital for the Insane, and an orphanage in Washington, D. C. They found the incidence of infestation to be 10.10 per cent. R. C. Rosenberger examined 1,280 patients at the Philadelphia General Hospital and found the incidence to be 13 per cent. The work of foreign investigators has been compiled by Stiles and Garrison (1906), who tabulated the results of thirty authorities on over 25,000 persons. This tabulation brings out the fact that the rate of infestation varies widely in different localities.

[1]Note: I desire to express my appreciation of the work of Prvt. Charles Freeman, Medical Department, who compiled most of these statistics.

Method of Examination.—Two noncommissioned officers, from each company which was to be examined, were detailed to supervise collection and transportation of the material. They were furnished with a mimeographed sheet giving explicit instructions and, in addition, such verbal information as was necessary in particular instances. Briefly, the method used for collecting material was as follows: The soldiers to be examined were given 15 c.c. of saturated solution of epsom salts before breakfast. Specimens were collected on newspapers placed upon wooden boards, a small portion was transferred to a paper ointment box with a piece of a wooden tongue depressor; the remainder, together with the newspaper, was placed in a large tin garbage can and later incinerated. The name of the soldier was written upon the ointment box; all soiled boxes were rejected. Specimens from each company were placed in suitable containers and transported to the laboratory, accompanied by a triplicate check list giving names and counties of origin of the soldiers. Examination was made on the same day. Six enlisted men from the laboratory personnel were selected and thoroughly trained in the recognition of such ova as might be found; one of them acted as record clerk. A small portion of the material was transferred to a slide with a piece of a wooden applicator and sufficient water applied to make a smooth, semi-fluid mass. If the feces were semi-fluid upon arrival, no water was added; 5,000 specimens were examined by introducing a small amount of the material in a centrifuge tube, filling the tube with water and stirring the mixture thoroughly. It was then centrifuged at high speed for five seconds, the supernatant fluid poured off, the sediment resuspended and again centrifuged for three seconds, after which examination of the sediment was made. It was found, however, that this method gave no better results than a direct smear, and after thorough comparison it was abandoned. Examination was made with the low dry lens and positive results confirmed with a high dry lens. All doubtful findings were checked by an officer and diagnosed by him. From 300 to 500 specimens per day were examined.

RESULTS

The parasites present were: hookworm *(Necator Americanus)*, round worm *(Ascaris lumbricoides)*, whip worm *(Trichuris trichiura)*, dwarf tape worm *(Hymenolepis nana)*, beef tape worm *(Taenia saginata)*, Cochin-China worm *(Strongyloides stercoralis)*.

A marked difference in the frequency of infestation of white and negro soldiers was notably evident. For this reason the results as to race are tabulated separately. The relative frequency of intestinal worms among white and negro soldiers was as follows:

	Number examined	Number infested	Per cent infestation
White soldiers.....	26,672	2,773	10.40
Negro soldiers.....	8,653	95	1.10

White soldiers were found to be about ten times more frequently infested than negro soldiers. The relative frequency of the different parasites among the white and negro soldiers is shown in Table I. This table shows that helminthiesis in general is not only more common among whites than among negroes, but that this also holds true for the various species of worms. In both races the ascaris was the species most frequently represented. This is in accord with the findings of most writers, but differs from the results of Stiles and Garrison, who reported a remarkably low (0.5 per cent) percentage of infestation with this worm. The hookworm came next in frequency, the incidence being nearly equal to that of the ascaris excepting it was somewhat lower among the negroes. Trichuris occupied the third place among the whites, but was least frequently met with among the negroes. Hymenolepis occupied the fourth point in frequency, a considerable number being present. Stiles, in 1906, stated that only about 121 cases of infection with this parasite had been reported for man, about twenty-seven of these occurring in the United States. He believed, however, that the dwarf tapeworm is the most common tapeworm in man in certain parts of this country, a belief apparently well founded and strongly supported by the findings here. Stiles likewise indicated the particular disposition on the part of negroes to infestation with this parasite. This is likewise the case in the present series, for while the general rate of infestation with intestinal worms among whites and negroes was as 10.4 to 1, the ratio for the hymenolepis is 3.1 to 1. Taenia saginata and strongyloides occurred only among the whites and were relatively uncommon. Oxyuris, taenia solium, and dibothriocephatus infestation were not encountered. While it is not surprising so far as the two last named are concerned, the absence of the pin

worm is quite remarkable. As has been stated by Stiles and others, the examination of the feces is an uncertain method of diagnosing the presence of pinworm. Probably the method of saline purgation employed here was responsible for the negative findings; there is also a probability that the ova of this parasite were not recognized, although when their continuous absence was realized they were especially looked for.

TABLE I.—*Relative Frequency of Intestinal Worms Among White and Negro Troops*

Species	White troops, 26,672		Colored troops, 8,653		Ratio of per cent infestation
	Number parasites	Per cent parasites	Number parasites	Per cent parasites	White: Negro
Necator americanus	926	3.47	24	0.28	12.1 : 1
Necator and ascaris	130	.49	....	....	....
Necator and trichuris	51	.19	....	....	....
Necator, ascaris, and trichuris.	24	.09	....	....	....
Necator Americanus (total)	1,131	4.24	24	.28	15.4 : 1
Ascaris lumbricoides	1,067	4.00	44	.51	7.8 : 1
Ascaris and necator	130	.49	....	....	....
Ascaris and trichuris	63	.24	....	....	....
Ascaris, necator and trichuris	24	.09	....	....	....
Ascaris lumbricoides (total)	1,284	4.82	44	.51	9.4 : 1
Trichuris trichiura	268	1.00	5	.06	16.6 : 1
Trichuris and ascaris	63	.24	....	....	....
Trichuris and necator	51	.19	....	....	....
Trichuris, ascaris and necator	24	.09	....	....	....
Trichuris trichiura (total)	406	1.52	5	.06	25.3 : 1
Hymenolepis nana	210	.79	22	.25	3.1 : 1
Hymenolepis and trichuris	6	.02	....	....	....
Hymenolepis nana (total)	216	.80	22	.25	3.5 : 1
Taenia saginata	12	.04	....	....	....
Strongyloides	16	.06	....	....	....
All parasites (total)	3,065	11.49	95	1.10	10.4 : 1

Multiple Infestations.—Two or more species of parasites in one person occurred 274 times. These concurrent infestations were only present among the whites. The explanation for this may be that only 95 infested negroes were found, whereas there were 2,773 infested whites. The parasites co-existed as follows:

Necator and ascaris	130
Necator and trichuris	51
Ascaris and trichuris	63
Hymenolepis and trichuris	6
Necator, ascaris and trichuris	24

Disparity in Prevalence of Intestinal Parasites Among Whites and Negroes.—Since the difference in the rate of infestation among the white and negro soldiers has been attributed by Frick and others to purely local factors, it has been deemed advisable to analyze the incidence with reference to the counties whence the soldiers came. It must be remembered that all, or the great majority, of these men were newly inducted soldiers and generally had come directly from their homes. Not all counties, because of the wide variation in the number of soldiers they furnished, lent themselves for a fair comparison. Taking only those which have furnished a comparable number of men (marked with an asterisk in the chart), it was found that, while some variation exists, the conclusion that the rate of infestation is higher among the whites than among negroes is well borne out in every instance. Table II shows the detailed tabulation.

Discussion of Racial Influence on Helminthiasis. — From the present study and that of others it seems indubitable that race is an important factor in the prevalence of intestinal worms. Stiles, in 1910, discussing hookworm disease, states that the indications at present are that the infection is more common, but with less severe results, in the negroes than in the whites. The same author found the rate of total infestations among the negroes 7 to 8 per cent in excess of that found among the whites. Ashford, King, and Igaravides discussed the question of race and immunity in relation to uncinariasis and cite the information of others. They contend that the African negro, while still remaining a carrier thereof, has gradually acquired an immunity or tolerance to the toxins of hookworm. They found the prevalence of hookworm much less among the negroes than whites. Allen J. Smith supported this view, arguing that the race longest infested should have acquired the greatest tolerance, while that infested the shortest time should have the least immunity to its effects. Frick, in 26,000 examinations for hookworm in soldiers, found 11.5 per cent positive among the white troops and only 1.1 per cent among the negro troops. He explains this disparity by the fact that the negroes did not live in the hills where the soil is sandy, but came from the delta region. From the present study it would seem, however, that the local factor is not determinative, since the prevalence in the various counties (Table II), in species of intestinal worms, is consistently higher in the whites than in the negroes. As stated, this deduction is based espe-

cially upon findings from such counties as, by approximately equal number of soldiers furnished and other similar conditions, lend themselves for fair comparison. The difference in the rate of infestation may be explained on the basis of acquired immunity as quoted above. That there are immunity processes going on is indicated by the work of Kolmer, who demonstrated complement fixing bodies in the blood of dogs infested with intestinal worms and who showed certain immunological relations among groups of parasites. The work of other investigators dealing with human infestation is cited by the same author. It remains to be determined whether antibody formation is greater in negroes than in whites.

CONCLUSIONS

The prevalence of intestinal worms among 35,000 soldiers from one state was found to be about ten times greater among the whites than among the negroes. This is seemingly due to race, since the proportion was maintained in the counties regardless of topography. Multiple infestation occurred only among the whites.

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TABLE II.—*Incidence of Intestinal Worms with Reference to Counties.*

Counties.	White troops, 26,672														Negro troops, 8,653						
	Necator americanus	Ascaris lumbricoides.	Trichuris trichiura	Hymenolepis nana	Taenia saginata	Strongyloides	Necator and ascaris	Necator and trichuris	Ascaris and trichuris	Hymenolepis and trichuris	Necator, ascaris and trichuris	Number of parasites	Number of men	Per cent of infestation	Necator americanus.	Ascaris lumbricoides	Hymenolepis nana	Trichuris trichiura	Number of parasites	Number of men	Per cent of infestation
Adair	5	4	2	2	1	....	1	.....	.....	.....	.....	15	132	11.36	....	....	....	....	....	14	
Allen	4	19	1	2	.....	....	2	...	.....	.....	.....	28	218	12.84	....	....	....	....	....	10	
Anderson	1	..	1	..	.....	....	.....	.....	.....	.....	.....	2	76	2.63	....	....	....	....	....	6	
Ballard	1	2	1	2	.....	....	.....	.....	.....	.....	.....	6	54	11.11	....	....	....	....	....	12	
Barren	8	21	1	4	.....	....	.....	.....	1	.....	.....	35	203	17.24	....	....	....	....	....	42	
Bath	1	..	..	3	.....	....	.....	.....	.....	.....	.....	4	97	3.19	....	....	....	....	....	22	
Bell	10	8	..	1	.....	....	3	1	.....	.....	1	24	37	32.87	....	....	....	....	....		
Boone	4	1	..	..	.....	....	.....	.....	.....	.....	1	6	123	4.87	....	....	....	....	....	9	
*Bourbon	..	2	..	1	.....	....	.....	.....	.....	.....	.....	3	121	2.47	....	1	3	....	4	144	2.07
*Boyde	12	3	..	1	.....	1	.....	.....	.....	.....	.....	17	125	13.60	....	1	....	....	..1	83	1.20
Boyle	2	4	1	..	.....	....	1	.....	.....	.....	.....	8	49	16.32	....	....	....	....	....	37	
Bracken	1	..	..	..	.....	....	.....	.....	.....	.....	.....	1	149	.67	....	....	....	....	....	14	
Breathitt	16	13	3	..	.....	....	6	2	2	.....	1	43	133	32.33	....	....	....	....	....	2	
Breckenridge	7	5	2	2	.....	....	.....	.....	.....	.....	.....	16	207	7.72	....	....	1	....	1	19	5.26
Bullitt	..	2	..	..	.....	....	.....	.....	.....	.....	.....	2	63	3.27	....	....	....	....	....		
Butler	8	10	2	2	.....	....	1	.....	.....	.....	.....	23	253	9.09	2	....	....	....	2	67	2.98
Caldwell	1	1	..	..	.....	1	.....	.....	.....	.....	.....	3	71	4.22	....	....	....	....	....	22	
Calloway	2	4	..	..	.....	....	.....	.....	.....	.....	.....	6	211	2.84	....	....	....	....	....	9	
Campbell	1	6	..	2	.....	1	.....	.....	.....	.....	.....	10	535	1.86	....	....	....	....	....	2	
Carlisle	1	..	..	1	.....	....	1	.....	.....	.....	.....	3	98	3.06	....	....	....	....	....	4	
Carroll	1	2	..	..	.....	....	.....	.....	.....	.....	.....	3	84	3.57	....	....	....	....	....	4	
Carter	6	8	..	1	.....	1	.....	.....	2	.....	.....	18	92	19.56	....	....	....	....	....		
Casey	6	22	8	1	.....	....	1	.....	1	.....	.....	39	182	21.42	....	....	....	....	....	4	
†Christian	..	1	1	..	.....	1	.....	.....	.....	.....	.....	3	158	1.89	....	....	....	....	....	50	
*Clark	5	8	4	2	1	....	.....	.....	.....	.....	.....	20	175	11.40	1	1	....	....	2	97	2.06
Clay	9	7	..	2	.....	....	3	.....	.....	.....	1	22	77	28.57	....	....	....	....	....	3	
Clinton	18	8	1	2	.....	....	1	1	.....	.....	1	32	139	23.02	....	....	1	....	1	6	16.66
Crittenden	1	4	..	3	.....	....	.....	.....	.....	.....	.....	8	170	4.70	....	....	....	....	....	19	
Cumberland	17	18	..	..	.....	....	7	.....	.....	.....	.....	42	117	36.75	....	....	....	....	....	19	
Davies	7	..	..	5	.....	....	.....	.....	.....	.....	.....	12	257	4.66	....	2	....	....	..2	90	2.22

Edmundson	3	5	..	2								10	91	10.98						3		
Estill	1	5	..	1								7	30	23.33						4		
Elliott	22	22	6	..			2	2				54	164	33.53								
Fayette	3	2	..	2				1				8	112	8.03						38		
Fleming	..	7	7	5				1				20	157	12.73						4		
Floyd	41	21	9	3			11	2	4	1	2	94	226	41.59						37		
Franklin	2	1	1	2								6	153	3.92						6		
*Fulton	..	2	2	1								5	132	4.54						100		
Gellatin	1	..	1	2					1			5	34	14.70						6		
Gerrard	5	5	2	1								13	156	8.33						65		
Grant	2	7	4	3								16	282	5.67								
Graves	3	12	1	3								19	358	5.30						40		
Grayson	10	9	2	3			3			1		28	338	8.28						4		
Green	2	2	..	11				1	1			7	216	3.02						11		
Greenup	5	12	1				2	1				22	153	14.37						5		
Hancock	4	1	..	..								5	86	5.81						6		
Hardin	4	7	3	1								15	206	7.28								
Harlan	14	13	6	..			4	1	2			40	135	29.66	1	1			2	37	5.40	
Harrison	2	2	..	..								4	222	1.80		1			1	25	4.00	
Hart	9	5	5	4			1					24	228	10.52						17		
*Henderson	3	4	1	2			1					11	300	3.66	1				1	199	.50	
Henry	2	1	..	..								3	98	3.05						24		
Hickman	..	3	..	2								5	93	5.37						8		
Hopkins	7	6	2	2								17	361	4.70	1				1	133	.75	
Jackson	5	1	1	..			1	2	1		2	13	84	15.47								
*Jefferson	15	26	5	7	1				1		1	56	2,417	2.31	1	6	2	1	10	1,161	.86	
*Jassamine	1	..	..	..								1	53	1.88						62		
Johnson	10	1	1	1			2	1				16	183	8.74								
Kenton	5	1	1	3	1	1	3					15	721	2.08		1	..	1	2	14	11.41	
Knott	22	25	9	2		..	4	1	3			66	109	6.05						10		
Knox	16	6	2	1		1		2			1	29	153	12.48		1			1	67	1.49	
Larue	9	5	1	4				1	2			22	141	15.60		1			1	7	14.28	
Laurel	13	7	1	2					2			25	60	41.66						10		
Lawrence	10	14	3	1								28	104	26.92								
Lee	7	1	..	..								8	33	24.24	1			1	2	7	28.57	
Letcher	20	30	11	..			2					63	148	43.10								
Leslie	9	13	3	2			6	3			1	37	141	26.24						5		
Lewis	2	12	5	3								22	141	15.60						3		
Lincoln	4	11	2	..								17	166	10.24		2			2	36	5.55	
Livingston	..	3	..	2								5	93	5.37						2		
Logan	3	6	1	2								12	162	7.40						15		
Lyon	2	3	..	..								5	766	.57						1		
McCracken	2	7	..	6								15	453	3.31	..	.1			1	147	.68	
McCreary	1	6	1	2		..	1					11	167	6.58								
McLean	10	5	3	1				1				20	98	20.40						18		
*Madison	6	9	2	..		1			1		1	20	232	8.62	1			1	2	125	1.60	
Magoffin	8	5	1	1	1	1	2	1	1	1		22	100	22.00								
Marion	2	6	..	3			1					12	202	5.94						66		
Marshall	1	2	..	1			1					5	168	2.97								
Martin	6	5	..	..			1		1		1	14	38	36.34								
*Mason	..	1	..	1					1			3	109	2.75						75		

TABLE II.—Continued

Counties	White troops, 26,672														Negro troops, 8,653						
	Necator americanus	Ascaris lumbricoides	Trichuris trichiura	Hymenolepis nana	Taenia saginata	Stongyloids	Necator and ascaris	Necator and trichuris	Ascaris and trichuris	Hymenolepis and trichuris	Necator, ascaris and trichuris	Number of parasites	Number of men	Per cent of infestation	Necator americanus	Ascaris lumbricoides	Hymenolepis nana	Trichuris trichiura	Number of parasites	Number of men	Per cent of infestation
Meade	1	2	1	..	.....	....	.....	.....	1	.....	.....	5	137	3.64	....	....	....	....	....	10	
Menifee	3	1	1	..	.....	....	.....	.....	.....	.....	.....	5	46	10.86	....	....	....	....	....		
*Mercer	..	1	..	..	.....	....	.....	.....	.....	.....	.....	1	138	.72	....	....	....	....	....	55	
Metcalfe	7	12	1	2	.....	....	.....	.....	.....	.....	.....	22	111	19.81	....	....	....	....	....	18	
Monroe	13	19	5	5	.....	....	3	.....	2	.....	1	48	277.	17.32	....	....	....	....	....	3	
Montgomery	1	1	4	..	.....	1	.....	.....	1	.....	.....	8	71	11.26	....	....	....	....	....	13	
Morgan	16	2	..	3	.....	....	1	.....	2	.....	.....	24	75	32.00	....	....	....	....	....		
Muhlenberg	1	3	1	..	.....	....	.....	.....	.....	.....	.....	5	298	1.68	....	....	....	....	....	45	
Nelson	1	2	2	1	.....	....	.....	.....	1	.....	.....	7	198	3.53	....	....	2	....	2	64	3.12
Nichols	1	1	..	1	.....	....	.....	.....	.....	.....	.....	3	61	4.91	....	....	....	....	....	18	
Ohio	11	9	1	1	.....	....	.....	.....	.....	.....	.....	22	234	9.40	....	....	....	....	....	9	
Oldham	..	..	..	..	1	....	.....	.....	.....	....	1	2	46	4.78	....	....	....	....	....	10	
Owen	1	2	..	..	.....	....	1	.....	.....	.....	.....	4	158	2.53	....	....	....	....	....	6	
Owsley	4	2	..	..	.....	....	1	.....	.....	.....	.....	7	26	26.84	....	....	....	....	....	1	
Pendleton	1	1	..	..	.....	....	.....	.....	.....	.....	.....	2	96	2.08	....	....	....	....	....	6	
Perry		19	15	7	3	..	1	2	111	...	.....	49	98	50.00	....	....	....	....	....	10	
Pike	51	34	12	4	3	2	8	3	8	1	2	128	407	31.20	....	1	....	....	1	23	4.34
Powell	7	1	..	..	.....	....	.....	2	.....	.....	.....	10	71	14.08	....	....	....	....	....	1	
Pulaski	20	10	9	..	.....	....	2	.....	.....	.....	1	42	100	42.00	....	....	....	....	....	15	
Robertson	..	1	..	..	.....	....	.....	.....	.....	.....	.....	1	23	4.34	....	....	....	....	....	4	
Rock Castle	12	8	5	3	.....	....	.....	.....	.....	.....	.....	28	136	20.58	....	....	....	....	....		
Rowan	5	10	1	..	.....	....	.....	1	.....	.....	.....	17	72	23.61	....	....	....	....	....		
Russell	8	10	4	..	.....	1	1	.....	.....	.....	1	25	106	23.58	....	....	....	....	....		
*Scott	..	3	..	1	.....	....	.....	.....	.....	.....	.....	4	146	2.73		1	....	....	1	92	1.08
*Shelby	2	4	2	..	.....	....	.....	.....	.....	.....	.....	8	145	5.51	....	....	....	....	....	113	
Simpson	..	3	..	..	.....	....	.....	.....	.....	.....	.....	3	50	6.00	....	....	....	....	....	2	
Spencer	..	1	..	1	.....	....	.....	1	.....	.....	.....	3	77	3.89	....	....	....	....	....	6	
Taylor	3	3	..	..	.....	1	1	1	.....	.....	.....	9	68	13.23	....	....	....	....	....	6	
Todd	1	4	..	..	.....	....	.....	.....	.....	.....	.....	5	117	4.27	....	....	....	....	....		
Trigg	1	4	3	..	.....	....	.....	.....	.....	.....	.....	8	182	4.39	....	....	....	....	....	35	

Trimble	..	1	..	..	.....	....	.....	.....	.....	.....	.....	1	92	1.08	....	....	....	....	....	1	
Union	1	9	1	2	.....	....	.....	.....	.....	.....	.....	13	189	6.87	....	....	....	....	....	39	
*Warren	..	3	..	1	.....	....	1	1	1	.....	.....	7	273	2.56	....	1	....	....	1	134	.74
Washington	1	3	1	2	.....	....	.....	.....	.....	.....	.....	7	189	3.70	....	1	....	....	1	41	2.43
Wayne	15	20	6	1	.....	....	1	1	1	.....	1	46	171	6.95	....	....	....	....	....	5	
*Webster	1	2	..	2	.....	....	.....	.....	.....	.....	.....	5	70	7.14	2	....	1	..	3	90	3.33
Whitley	24	11	6	8	1	....	6	4	1	.....	.....	61	356	17.13	....	....	....	....	....	4	
Wolfe	18	15	3	1	.....	....	7	2	3	.....	1	50	132	37.87	....	....	....	....	....	.....	
*Woodford	1	2	..	..	.....	....	.....	.....	.....	.....	.....	3	121	2.48	....	1	....	....	1	95	1.05
Counties unknown	186	284	58	42	3	2	19	9	14	1	3	621	5,984	10.36	4	11	7	1	23	2,507	.91
TOTAL PARASITES	926	1067	268	210	12	16	130	51	63	6	24	2,773	.....	.....	15	35	17				
TOTAL NUMBER OF MEN	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26,672	.....	....	....	....	....	....	6,948	
TOTAL PER CENT PARASITES	3.47	4.00	1.00	.79	.04	.06	.49	.19	.24	.02	.09	10.40	.....	.....	.22	.50	.25	....	.071	.04	
State of Alabama	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	3	2	....	....	865	.11
Per cent of worms	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.70	.34	.23	....	....	.....	1.27
State of Tennessee	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3	6	3	....	....	840	.12
Per cent of worms	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.36	.71	.36	....	....	.....	1.43
Grand total	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.24	44	22	5	....	.....	95
Grand total, men	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	....	....	....	....	....	8,653	
Grand total per cent	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.28	.51	.25	.06	....	.....	1.10

EDITORIAL

AN APPEAL

As our volunteer officers of the Medical Corps are one by one translated back to their civilian status, it becomes apparent that The Association of the Military Surgeons is by way of losing many estimable and worth-while additions to its membership, *in posse* as well as *esse*. It behooves us, therefore, to make a direct appeal to these physicians, that they will apply for definite membership in our organization, not merely as the best means of keeping in touch with their comrades and associates of the war period and of preserving their interest in military medicine, but also as a simple matter of loyalty and patriotism. For it is not claiming too much to assert that this association includes the best elements in the Medical Corps of the Army, Navy and Public Health Service and that The Military Surgeon is to all practical intents and purposes the literary organ of the Medical Corps of the Army. Membership in this organization would, therefore, seem the very best way to preserve one's association with the Army. Some of our medical officers as they go into retirement may, perhaps, feel dissatisfied or even disgusted at one thing or another in their experiences, and so will feel disinclined to join our body. But let them be assured that this is only one of the natural and usual effects of war fatigue, particularly in a war of such dimensions as the one we have just been through.

The transition from the pleasant ways of civil life to the hardships and disagreements of military service at the front has been rapid and sudden, and no truthful person could describe military service in warfare as pleasant. But, however unpleasant it may be to go through physical hardships, indefinite periods of enforced idleness and the pangs of hope deferred, some just perception of the whole business of soldiering is necessary and, as the months and years go by, those who have served with us in this war will gradually find their sources of dissatisfaction vanishing and will begin to feel proudly of their period of service, as they realize that their experiences have been only just what every soldier goes through in a war. Murmurs of dissatisfaction need not, therefore, detain us long.

'Tis but the flapping of the sail
And not a rent made by the gale!

Let us endeavor to face squarely some of the complaints and criticisms which have been or will be cast up against the Medical Department by the disappointed, the disgruntled, the disabled or the disinherited. In each case, these criticisms will be found to center upon the

narrowness, bigotry, cruelty or intransigeance of some individual rather than upon the military methods and regulations themselves. One physician complains of the intolerance and unfriendliness of the leader of his hospital unit (a reservist), although the twain were as David and Jonathan before they went into the war. Another finds all chances of promotion, or even of suitable assignment to duty, blocked because his commander had a grudge against himself or his family. A third is sore at the rough handling and coarse language he got from sergeants while in the ranks at Oglethorpe. Now the *crux* in all these cases is the personal element. Military life in the open does one thing thoroughly—it brings out all the good or all the evil that is in a man. If he is of the big-hearted, broad-minded type, who knows how to overlook human foibles and go after the big things, his qualities will be accentuated in the open, where he will be loved by his comrades and subalterns as a good fellow. If he is your narrow man of finikin ways and arrested development, who nags, browbeats, bullies, and trifles with his subalterns, who confronts ideas with a closed mind and plays the old maid generally, he will be correspondingly hated. But let us, at least, blame these things upon the man and not upon the conditions under which he works. He would be (and probably is) the same in civil life, or even in the domestic circle, whenever opportunity offers.

We feel sure that the sentiment of most of the men who have served through the war with us will be that the hazards of the future are too great to permit any of us to scold, whine and repine by the wayside, for long together, and that it is the plain duty of every loyal citizen to support the Army and Navy of his country as never before. Let us not "throw overboard the major proposition in order to support the minor," and let us not call down an indictment upon a whole organization on account of the crimes or follies of a few individuals in it.

The testimony of most of the physicians who have served in our Medical Corps, particularly of the most eminent, has been mainly to the effect that they would not have missed their military experiences for anything else in life and that they have learned many things never suspected by them in regard to the organization and standardization of medical practice, the administration of civil hospitals, the handling of disease on a grand scale, etc. It is self-evident that military administration in hospital not only standardizes the treatment of diseases but actually secures diagnosis and treatment for the patient, a thing which might be shamefully neglected by ignorant or unscrupulous practitioners and nobody the wiser for it. In a military hospital, properly administered, the surgeon or internist is immediately put upon his mettle in the eyes of his fellows and military superiors. His abilities and incapaci-

ties become easily apparent, and as in the university clinics of the English type, he must at least diagnose and treat the conditions before him.

Many physicians from the country districts and the smaller cities will, through the different phases of military experience, have come in contact with features of medical science which they never could have acquired in a community numbering only a few patients. On the other hand, the Medical Department of the Army has profited in this war by the advice and service of some of the most eminent specialists in the medical profession, men who have given services of priceless value for the relatively small salary which the army officers receive. The advantages derived by the medical profession and the Army Medical Corps in this war have, therefore, been mutual and of equal value. The Medical Corps of the Army wishes from now on to keep in close touch with the American medical profession, and it is fair to assume that the medical profession of our country will lose nothing by maintaining its war-time association with the Army. Unfortunately, there are no provisions for continuing the military services of medical officers of the Reserve Corps, even temporarily. The Association of Military Surgeons is, therefore, the logical bond of union between the Army Medical Corps and the medical profession of the country. Shall we not, then, grasp this unique opportunity for elevating and improving the status of medicine in our country through the coöperation of its two largest organizations, viz., the American Medical Association and the Association of Military Surgeons?

Such an opportunity comes but once in a nation's life and, if we miss it now, the omission may prove a matter of regret in years to come. As General Munson has so effectively put it in his address at a recent conference of the Council of Medical Education of the American Medical Association (March 3, 1919):

> I cannot forbear from expressing my admiration at the manner in which the profession in uniform adapted itself to conditions. Its members accepted cheerfully the results of the stock-taking of their qualifications, even though the latter might not have been flattering, and coöperated in every way to remedy the defects thus made apparent. Their eyes were opened to any short comings of the profession as a whole, and it is safe to assume that their military experience has shaken them out of complacency and given them new ideals and broader purposes. One of the results of the war will be a better and more competent medical profession, the members of which will look to the medical educators of the country to set high ideals and provide the facilities for their attainment.

We are asking the members of the American Medical Association who have served with us in the recent war to help us to live up to the high scientific standards which they have maintained during their period of military service, and we, on our part, are keen to be of use in such

matters as organization, self-discipline, standardizing practice and other things which are natural and necessary functions of military organization. It will be our aim to make THE MILITARY SURGEON a special medium for working out these great problems, in aid of which we ask the coöperation of all medical officers now retiring from active duty who have not yet joined this Association.

THE BABYLONIAN CADUCEUS

On the title-pages of books published by one of the great medical printers of the sixteenth century, Johann Froben (1460–1527) of Basel, we frequently see a device which the uniform of our Medical Corps has rendered familiar, namely, the caduceus with the entwined serpents. In the case of Froben's device, the caduceus is not winged but surmounted by a dove, and, in the complete emblem, there was a Greek inscription which read: "Be ye therefore wise as serpents and harmless as doves." This is perhaps the first instance in which the *kerykeion* or caduceus of Mercury is associated with medicine, Just a little later, Sir William Butts [–1545], physician to Henry VIII, was the first medical man to employ the caduceus in his crest.[1] About the middle of the nineteenth century (1844), another firm of medical publishers, J. S. M. Churchill of London, began to employ the caduceus on its title-pages. A little later, in 1856, the caduceus appears on the chevrons of hospital stewards in the U. S. Army. For a long period it has been part of the insignia of officers of the Public Health Service. It is not until 1902 that it is first seen on the uniforms of medical officers of the U. S. Army.[2] As the Hermes of Greek mythology was variously the god of fertility, the messenger of the gods, the conductor of souls to Hades, the god of commerce, merchants and thieves, it has been sometimes argued that the symbolism of the caduceus is not strictly medical and that it should be replaced by the Æsculapian staff with a single serpent, which is, in effect, the collar ornament of the Royal Army Medical Corps.[3] But recent investigations on the pre-history of the caduceus by A. L. Frothingham[4] indicate that it had its origins in civilizations much earlier than the Greek, and that, in the first instance, it symbolized certain vague groups of mystic or magic processes which, in the cult of prehistoric man, were anterior to medicine, in our sense, but certainly inclusive of it.

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[1] Clippingdale, S. D.: "Heraldry and Medicine. *Antiquary*, Lond., 1915, n. s., xi, 417. Clippingdale states that the caduceus also occurs in the arms of Sir William Broadbent, Sir James Burrows, Sir Lauder Brunton, Sir Rickman Godlee and Lord Ilkeston, all medical men.

[2] McCulloch, C. C.: MILITARY SURGEON, 1917, xli, 143.

[3] McCulloch: *op. cit.*, 143.

[4] Frothingham, A. L.: "Babylonian origin of Hermes the snake-god, and of the Caduceus." *Am. Jour. Archaeol.*, Concord, N. H., 1916, xx, 175–211.

Archaeologists have found that Hermes was originally a pre-Olympian deity of Babylonian extraction, and that this proto-Hermes was invariably a snake-god, who, as the deity of springtime and of fertility appeared in the guise of a double snake, male and female. Now in the most ancient cults, the snake was always the symbol not merely of medicine but also of those mystic and magic processes which included it, and of which the power of conferring fertility, potency or fecundity was one of the most awe-inspiring. In the earlier Babylonian and Hittite

Caduceus on a Babylonian Vase in the Louvre (4000–3000 B. C.).

figurations, the caduceus is not an emblem but a god in itself; in others, it is carried in the hand of gods or goddesses, as a sign and symbol of supernatural power. One of the earliest examples of the first variety occurs on a libation vase of green steatite found at Telloh (Lagash) and now in the Louvre. This vase, dedicated to the god Ningishzida by Gudea, ruler of Lagash, goes back to the remote period 4000–3000 B.C. On this libation vase, the god Ningishzida is represented as a large caduceus, formed by two serpents entwined about a staff, and flanked by two worshippers in the shape of genii, of the well-known Assyro-Babylonian character. On various Babylonian seal-cylinders, Ningishzida is represented as a priest-like figure with snakes sprouting from his shoulders, or as a strange, helpless, Lazarus-like image, tightly wrapped by serpents and resting on their coils, usually flanked by the mother-goddess Ishtar, of whom, as god of fertility in the springtime, he was the messenger. In other figurations, the serpents are uncoiled and the god rests on his own feet. In others, the independent caduceus, detached from the human figure, is represented as an object of worship. In others, the

caduceus is borne, as stated, by a god or a goddess, in token of power.[5] On a Roman coin of Hierapolis, a Hittite caduceus-god is clearly figured inside a temple or tabernacle. From Mesopotamia, the symbolism of the caduceus was imported by the Etruscans and early Latin peoples, among whom it became a typical house-god. In the earlier Greek mythology, the double-sexed caduceus-god is gradually replaced by a phallic or priapic herm-god, derivable, it would appear, from the many ithyphallic figures which abound in the Babylonian seals. Now the devotees of the Freudian cult would probably interpret all this by the stock statement that the caduceus, like the snake itself, is a "libido-symbol." But this is obviously too narrow a reading of the workings of the primitive mind and of those mythic processes which may be summarized as "making medicine"; and indeed Jung, no doubt disconcerted with the narrowness of sexual symbolism, has made the concept "libido" broad enough to include potential energies of any kind. To mere outward seeming, the savage and the primitif saw all things in sex and sex in all things. But if we consider the strange Cretan, Egyptian and Babylonian figures of 4,000 years ago, some of them with outstretched arms grasping serpents, we are more and more impressed with the sense of grasping and groping for incomprehensible power, as in the Indian snake-dances, instituted for rain-making, promoting fertility of crops, and other phases of "making medicine." Virtue and virility both derive in fact, from *vir*, a man; and one of the most striking generalizations of recent physiology is to the effect that the "soul" is the integration of the whole being of the individual, the summation of all his potentialities. Thus it frequently happens that an individual might be sexually competent yet an abject, physical coward; or he might be physically a man, yet utterly lacking in moral or intellectual courage. It is the summation of all these potentialities that renders him "all there" as a man. At this highest level of morale we have the Horatian *integer vitae, scelerisque purus*, as sketched by the great philosopher:

> His body and every organ is under the same laws. His body is a jar in which the liquor of life is stored. Will he spend for pleasure? The way to ruin is short and facile. Will he not spend, but hoard for power? It passes through the sacred fermentations, by that law of nature whereby everything climbs to higher platforms, and bodily vigor becomes mental and moral vigor. The bread he eats is first strength and animal spirits; it becomes in higher laboratories, imagery and thought; and in still higher results, courage and endurance. This is the right compound interest! This is capital doubled, quadrupled, quintupled; man raised to his highest power.

It is noticeable that Emerson prizes courage and endurance above

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[5] Frothingham has taken nearly all his illustrations of the caduceus from a publication of the Carnegie Institution of Washington, viz., William Hayes Ward's "The Seal Cylinders of Western Asia" (1910).

mere intellectual power, just as Voltaire observed that the great difficulty with "*les honnêtes gens*" is that they are always cowards. Prehistoric man, courageous as he was, strove pathetically to develop mind and sharpen his wits, as the best means of attaining to power to deal with the hardships of his environment and with living enemies of gigantic size; but the sharper-witted man of later type is not always the most courageous in battle. Sometimes he is the mere bragging dodger and impostor, the Miles Gloriosus and Captain Bobadil of the old plays. In confronting unknown conditions, all are afraid the first time and have to learn that "courage is the courage of having done a thing before."

Thus the Babylonian symbol really stands for potential energy, and for "making medicine," as one phase of it. One recent phase of "making medicine" has been the creation of a deliberate method of developing morale in recruits and military organizations, the invention of an officer of the Medical Corps. Seen in the right perspective, then, the caduceus remains a respectable and even venerable symbol of power, whether as vested in the physician, the medical officer, or in any other avocation that goes back to the remote period when courage, kingship, godhead, clairvoyance, sorcery and leechcraft were only so many phases of one and the same thing.

F. H. Garrison.

COMMENT AND CRITICISM

ANOTHER WORD ON HOSPITAL MESSING

In the March issue of The Military Surgeon there appeared two articles, one somewhat critical toward, the other unqualifiedly in favor of, the cafeteria system of messing in military hospitals. Both were profitable reading for anyone working on this problem and suggested this description of yet another, and perhaps hitherto undescribed, method of serving food to patients. This was put in operation on the hospital ship *Comfort* when that vessel was suddenly filled to capacity with bed-ridden cases—all wounded men from France. Every fixed bunk was occupied and we had, besides, about one hundred partially ambulant cases. They might have been really ambulant ashore, but a large number of them having lost either one leg or one arm, they had much difficulty in getting about on a ship in a seaway, and it was soon found that food had to be brought to all those who had lost a leg.

The ward pantries had not been designed to care for a full quota of bed cases, and the so-called convalescent ward, having about one hundred and forty bunks, was altogether unsuited to individual service for so many men. So at 10 in the morning many patients were still without breakfast, and those who were fortunate enough to get something, got it cold and unpalatable. All were somewhat unhappy, though wonderfully uncomplaining, as our soldiers have so generally shown themselves in trying circumstances.

The old feeding system was plainly chaotic under these circumstances. Before the next meal we devised the "Mobile cafeteria" and thereafter everybody was happy. Two men started out with a large new coaling basket filled with mess gear and distributed to each patient his outfit—plate, bowl, or two bowls if necessary, cup, knife, fork and spoon. Then came four men, each with a white enameled bucket. For dinner the first had meat, the next potatoes, the third a vegetable, and the fourth the dessert. These were followed by another man with a big kettle of hot coffee or tea, or, for breakfast, cocoa. How they loved that sweet cocoa and the desserts! They were all fruit and sugar hungry, so we gave them plenty of canned fruit and ship-made pie. When we got to the Azores, we bought all the oranges in sight and served them in the evening throughout the entire trip. Bread, previously buttered, two pieces

face to face, was also distributed from new and clean coaling baskets.

Beyond dressing these old surgical cases there was little to be done for them in a professional way. The one thing which would contribute to their upbuilding and comfort was good food, hot and in unstinted quantity, and they responded to this treatment by developing a noticeably better color, getting distinctly stronger and keeping happy. We worked this plan throughout the trip in every ward and in the improvised spaces where the more or less ambulant cases were served. The menu too was modified from the conventional. Many of the cases represented varying degrees of helplessness, and it was found that the usual roasts of meat gave them trouble in the cutting. We therefore ground beef into hamburger steak and meat-loaf; made good Irish stews, and for variety camouflaged stews into "sea-pie" and "railroad hash." Upon arrival in New York a lieutenant colonel from the War Department came aboard to inquire into the food and our messing arrangements. We asked him how he found things. "Well," he said, "I asked one fellow how the food was during the trip. 'Oh, boy! Some chow!'" That was our answer. It is quite certain that the method employed in serving food contributed largely to our success in this matter, aside from the hearty coöperation of the supply department in providing wholesome, well-cooked food in abundant quantity.

The writer has studied the sailor man eating in good health and bad, for the past twenty-odd years and, speaking now only for military hospitals ashore, has come to the conclusion that little can be said for the cafeteria system except expediency, and perhaps that the food, served by this method, gets to the ultimate consumer a trifle warmer. It is labor and trouble saving, and that is about all that can be said for it. It is just feeding, and food, even for the sick and convalescent, should be something more than a matter of calories and carbohydrates.

Of course, during the present state of affairs, with our institutions more than filled and labor almost impossible to get, particularly commissary employes, this method of messing is the best solution of the problem, but it should not be too loudly proclaimed as the final answer to hospital feeding for normal times. The cafeteria system is, after all, a bread line somewhat glorified and seems to over-emphasize *food*, losing sight of the element of good cheer and the factor of comfortable sociability in the full enjoyment of a meal. Standing in a long line with a plate and a bowl three times a day

does not contribute to a young man's self-respect, and hurried eating at a more or less littered table, some coming, some going, is certainly neither pleasant nor conducive to keeping or learning good table manners.

The cafeteria line is not what many fondly think it is—a nice counter to walk up to, where you can leisurely choose what you will have from a smiling and agreeable person or persons behind the counter anxious to please. Not by a long way. There is not time for all this niceness. The line behind is impatient and the men behind the counter generally cannot be made to take a deep interest in the wants of the man in front. The food is generally just spooned on the plate, hit or miss, and I have seen apple sauce dropped right into the stewed corn or pickled beets. It has been found, by actual experience, that men can be comfortably messed at tables in a hospital where food is served as it is in the home—with tablecloths, if you please; not fancy ones, being made of navy twill, two breadths neatly sewed together, but white and clean and attractive, and at such tables the men sat contentedly and munched their food leisurely because things were pleasant. The tablecloths were perhaps a super-refinement, but even without them, the method of messing can be carried out again and should be in hospitals on a peace basis. Sailors and soldiers are adaptable creatures and very human, doing generally in Rome as Romans do, and if they are fed nicely they usually behave nicely. We found that they did not much abuse our interest in their well-being.

Now that food conservation is no longer the pressing fashion that it was (to be honest, there was more talk than practice in this, for I found no conscientious objectors, of high or low degree, to pie in the Navy), it might be well to lay less stress on food economy in our discussions of messing systems, particularly for the sick, always, of course, having in mind avoidance of waste or extravagance, and apply ourselves more to getting real nourishment and increase of good health out of our hospital meals. I do not believe in the efficacy of the "clean plate" advocated in one of the articles in the March number. Getting a plate full of, say, stew is like playing the lottery. It may be good stew, and, having in mind our temperamental cooks, it may be pretty bad stew. Upon trial it turns out not to our liking at all, but eat it one must or go off to the canteen and fill up on apples or chocolate bars and Uneedas, which are a bad substitute. Imagine, then, the officer of the day standing in the mess hall to see that you eat your plate clean!

How would you like to have a policeman in your dining-room? Being officer of the day, he is presumably a gentleman, and being that, how he must enjoy his job, and not enjoying it, how useful he will be, and in any case how agreeable to the soldier.

There is much talk about the absence of waste in the cafeteria system. What becomes of the left-overs? Do we ever follow them to their end? We may hope and even positively say that they are used again, but are they really? What can you do with a small pot full of spaghetti or a messed-up pan of bread pudding? Serve them over? Did you ever try it when feeding a thousand? In most cases, when re-served, it is not attractive and, even granted that it might be, and is, served to the ten it will reach, the rest want to know where theirs is. That is the way it works out. Each meal must be cooked for a definite "approximate" number, and one cannot trust to possible left-overs to make up a meal when dealing with large numbers. There is no practical way yet discovered for obviating that inevitable overhead waste which is unfortunately a part of the business. Overzeal to provide just enough usually results in a shortage, and if five men get little or nothing, for those five that meal has been a flat faliure, the hospital is a "bum feeder," and is so advertised in tones louder than the praise of those well fed.

Practical and substantial economies are achieved chiefly by exacting honest weights and full compliance with specifications from contractors and sharp supervision of the commissary force, coupled with careful estimates and sensible meal arrangements based on experience and accurate knowledge of conditions as they fluctuate from day to day, rather than by any specific system of messing.

P. J. Waldner,
Lieut., Medical Corps, U. S. Navy.

OBSERVATIONS ON THE MILITARY VALUE OF THE IMMUNITY CONFERRED BY PREVIOUS ATTACKS OF MEASLES, SCARLET FEVER AND MUMPS

The immunity conferred by previous attacks of certain of the contagious diseases is not absolutely constant, but constitutes a factor the importance of which does not seem to have been sufficiently appreciated in the Army.

At Camp Mills, Long Island, in the fall of 1917, both rubeola and rubella were epidemic. As patients were questioned on admission

to the camp hospital, very noticeable was the fact that those suffering from rubella (German measules) almost invariably gave a history of having had one severe attack of true measles, while those with rubeola (measles) denied ever having had a previous attack of any kind or admitted having had it only in mild form. So noticeable was this that it became a factor of distinct importance in determining the diagnosis in early doubtful cases and often formed the basis for isolation into one or the other groups, later events almost invariably substantiating the history. Unfortunately the press of work, and a personnel insufficient for the necessary extra clerical work, prevented making a careful statistical study.

More recently at the U. S. Army General Hospital No. 9, Lakewood, N. J., an opportunity offered for the corroboration of the experience at Camp Mills. On August 25, 1918, 100 corps men were transferred from Camp Greenleaf, where measles had been epidemic, for duty at this hospital, where we had had no cases of measles for several months. On September 2 two members of this detachment developed measles and on the next day three more. Three of these five patients had never had measles in either form, one had had it in mild form, and the fifth had had it only once but had no knowledge about the severity. A survey was made immediately of the remaining 95 men. They were quartered by themselves in one of the unused wards of the hospital pending the completion of the new barrack buildings. Of the 95, six had never had measles in either form; two had no definite knowledge about it; 47 had had measles once or twice, at least one attack being severe; 26 had had measles once or twice but had no recollection of the severity, and 14 had had measles once (occasionally twice) in mild form.

The entire detachment was placed under inspection morning and night, temperatures being recorded, and they were assigned to duty which would keep them from contact with the patients as far as possible. On September 13 and 16 four more cases developed; three of these patients had never had measles, and one had had it once in mild form. The remaining members of the detachment who had given a definite history of two attacks of measles, one of which had been severe, were then released from inspection.

On September 25 the tenth case occurred in one of the men who had never had measles. Inspections were then discontinued on all of the others except the remaining two who had never had measles. These two men were transferred from their regular quarters to the observation ward. After twenty days they were released and joined their detachment. Two days later (October 17) one of

them came down with measles, twenty-two days after legitimate exposure to the last case. This incubation period was so long that we were never sure that the strict quarantine of the isolation ward, which was next to the observation ward, had not been violated. To sum up: of the eleven patients who developed measles, eight had never had a previous attack, two had definite knowledge that they had only had measles once in mild form, and one had had one previous attack of measles, severity not known. No other cases occurred either among patients or other members of the detachment.

The advantage of accurate information of the immunity conferred by previous attacks of measles, scarlet fever and mumps is obvious in the determination of any measures for quarantine. Although this immunity is not invariable, nevertheless, when this information can be obtained, it would seem to be of sufficient worth to warrant a definite entry on the soldier's service record which would be comparable to the record made of typhoid and smallpox vaccinations. The information could be elicited at the time of the first physical examination when there would be no special incentive toward misrepresentation, a temptation which some soldiers find difficult to resist when confronted with the alternative of quarantine. The differentiation between previous attacks of German measles and true measles is not always easy, but many individuals have definite recollection or information on the subject, particularly as to the distinguishing distressing cough of true measles. This forms a landmark in the history, very rarely simulated in German measles. A definite history of two attacks of measles also is significant. Second attacks of true measles are rare; second attacks of German measles are less rare, although other diseases in childhood are sometimes mistaken for them, notably mild forms of scarlet fever. As a rule, however, the history of an attack of scarlet fever and also mumps is clear-cut and definite.

Conclusions

Immunity conferred by previous attacks of measles, German measles, scarlet fever and mumps should be recorded on the service record of the soldier at his first physical examination. Subsequent attacks while in the service should be recorded also. This information possesses practically the same significance as does the record of typhoid and smallpox prophylactic vaccination.

Jack C. Gittings,
Lieutenant Colonel, M. C., U. S. A.

AWARD OF DISTINGUISHED SERVICE MEDAL

We note in the U. S. Bulletin of March 26, 1919, that the Distinguished Service Medal has been awarded to Lieut. Gen. Sir T. H. J. C. Goodwin, Director General, Royal Army Medical Services. This will be a matter of gratification to the many friends of General Goodwin in this country, who are very sure that it is not an undeserved honor.

J. R. C.

INTERNATIONAL RED CROSS CONFERENCE

We are in receipt of the following news item from the American Red Cross:

With a view of preparing a program to relieve suffering and combat disease in the general interest of humanity the Committee of Red Cross Societies has called a conference of leading experts of the world to be held at Cannes, France, beginning April 1. Below is a list of the men, each a foremost specialist in his chosen field, who have been invited to attend the conference as representatives of their respective countries, France, England, Italy, Japan and the United States:

FRANCE

Prince Paul Emile Roux, Professor, Director Pasteur Institute, Paris.
Dr. F. Widal, Physician to Hospital Cochin, Paris.
Major Edouard Rist, Service de Santé, France.
Dr. Calmette, Pasteur Institute Lille, Director.
Dr. Leon Bernard, Paris.
Professor Paul Courmount, Lyons.
Dr. Chas. Louis Alphonze Laveran, Prof. Protozoölogy, Pasteur Institute, Paris.
Dr. Milian, St. Louis Hospital, Paris.
Dr. Armand Delille, Paris.
Dr. Maurice Pehu, University of Lyons.

ENGLAND

Sir Wm. Osler, Regius Professor of Medicine, Oxford University.
Sir Walter M. Fletcher, Secretary of Medicine, Research Committee.
Colonel S. Lyle Commins, Adviser in Pathology, B. E. F.
Sir Robt. Phillips, Edinburgh.
Sir Arthur Newsholme, London.
Dr. F. W. Menzies, Principal Assistant, Medical Office, London County Council.
Lieut. Col. Sir Ronald Rose, Consultant for Malaria, British Army, Professor of Tropical Sanitation, University of Liverpool.
Col. L. W. Harrison, R. A. M. C., London.
Sir Wm. Leslie Mackenzie, Medical Member, Local Government Board for Scotland and Royal Commission on Housing.
Dr. Truby King, New Zealand.

ITALY

Dr. Ettore Machiafava, University of Rome.
Lieut. Col. Aldo Castellani, University of Naples.
Dr. Giuseppe Pastanelli, University of Rome.

Col. Caesar Baduel, Florence, Chief of Bureau of Sanitary and Local Welfare, Italian Red Cross, Rome.
Dr. Poli, University of Rome.
Dr. Ducroy, University of Pisa.
Dr. Valguassa, University of wome.

JAPAN

Dr. Ryotaro Inaba, Director of Hygiene Laboratory, College of Medicine.
Dr. Kiyoshi Shiga, Professor, Imperial Institute for Infectious Diseases, Tokio.
Dr. Hideyo Noguichi, Rockefeller Institute for Medical Research, N. Y. City.

AMERICA

Dr. W. Henry Welch, Director, School of Hygiene and Public Health, John Hopkins University.
Dr. Simon Flexner, Director, Laboratories of Rockefeller Institute for Medical Research, New York.
Dr. Hermann Michael Biggs, Public Health Commission, New York State.
Dr. Edward Robinson Baldwin, Director of Edward L. Trudeau Foundation for Tuberculosis, New York.
Dr. Theobald Smith, Director of Animal Pathology, Rockefeller Institute for Medical Research, New York.
Dr. Wickliffe Rose, Director General International Health Board, Rockefeller Foundation.
Col. Geo. Walker, U. S. Army, Fellow, American College of Surgeons in Charge of Venereal Diseases, A. E. F.
Col. Homer Swift, U. S. Army, Consultant in Medicine, A. E. F.
Col. William F. Snow, A. E. F. Army, President of Association of State and Provincial Boards of Health of North America.
Dr. Luther Emmet Holt, Professor, Diseases of Children, College of Physicians and Surgeons, Yew York.
Dr. Samuel Hamill, Professor, Diseases of Children, Philadelphia Polyclinic and College for Graduates in Medicine; Director, Child Welfare, for State of Pennsylvania.
Dr. Fritz Talbor, Chief of Children's Medical Department, Massachusetts-General Hospital, Boston; American Red Cross representative.
Dr. Livingston Farrand, formerly President of the University of Colorado; Director General, American National Red Cross.
Maj. A. M. Garvin, Chief, Bureau of Tuberculosis, A. R. C., France.
Maj. Wm. Palmer Lucas, Professor of Pediatrics, University of California Medical School; Chief of Children's Bureau, American Red Cross, France.
Col. Richard P. Strong, U. S. Army, M.D., Sc.D.; Director, Department of Medical Research and Intelligence, American Red Cross; Professor Tropical Diseases, Harvard University, Medical School.

ADDITIONAL REPRESENTATIVES

Asst. Surg. Gen. N. S. Cummins, U. S. Public Health Service, now in France.
Col. F. Russell, representing War Department in connection with Public Health Conference.
Lieut. Col. Lindsay R. Williams, U. S. Army.

Acceptances have already been received from a majority of those to whom invitations have been sent, and it is expected that a favorable reply will be received from

the others before April 1. These first conferences at Cannes are preliminary, on the part of the Committee of Red Cross Societies, to formulate and to propose to the Red Cross societies of the world an extended program of Red Cross activities in the interest of humanity.

The first conference will have to do with the preparation of part of a program which deals with the organization of the International Council and Bureau of Hygiene and Public Health, which will consider the work to be undertaken in connection with the prevention of epidemic disease, tuberculosis, venereal diseases and child welfare. Specialists who will attend are the recognized authorities on these subjects. As a result of these conferences a complete program will be made which will deal with the latest and best means to relieve suffering and combat disease.

This program will be submitted at a conference of all Red Cross societies to be held in Geneva thirty days after peace is officially declared. The call for this later conference was issued on February 13 by the International Red Cross at Geneva. Announcement of the formation of the Committee of Red Cross Societies was made in Paris about three weeks ago. It has established headquarters at Cannes, with administrative headquarters at No. 2 Place de Rivoli, Paris. The committee is composed of representatives at Red Cross Societies of France, Great Britain, Italy, Japan and the United States, with Henry P. Davison, formerly chairman of the War Council, American Red Cross, as chairman.

THE MORTALITY IN THE FRENCH AUXILIARY ARMY MEDICAL CORPS

A recent communication made by M. Gilbert Laurent to the French Interparliamentary Medical Group put the total number of civilian medical practitioners mobilized for war purposes at 2,169. Of these, 372, or 17 per cent, had died during the war, 259 of wounds and 113 from other causes. *The Lancet*, London, March 29, 1919.

ASSOCIATION NOTES

THE ANNUAL MEETING OF THE ASSOCIATION WILL BE HELD IN ST. LOUIS, MISSOURI, BEGINNING MONDAY, OCTOBER 13, AND LASTING UNTIL WEDNESDAY, OCTOBER 15, 1919. THIS WAS DECIDED AT A MEETING OF THE EXECUTIVE COUNCIL ON MAY 1. IT IS HOPED THAT ALL MEMBERS WILL MAKE A SPECIAL EFFORT TO BE PRESENT AT THIS MEETING AS IT IS DESIRED TO HAVE AS MANY AS POSSIBLE PRESENT TO DISCUSS PLANS FOR THE ADVANCEMENT OF THE ASSOCIATION. FURTHER NOTICE OF THE MEETING WILL APPEAR IN THE JOURNAL IN AN EARLY ISSUE.

The following named officers were elected to membership in The Association of Military Surgeons of the U. S., May 1, 1919:

Medical Corps, U. S. N.

Lieut. G. W. Millett, M. C., U. S. N.

Medical Corps, U. S. A.

Majors

Asa Wesley Graves
Henry Eugene McClenahan
N. Philip Norman

Captains

Bruce Gould Blackmar
William P. Burke
Albert E. Conrad
John W. Cox
John Elmer Gotwals
Clifford C. Leck
Gordon Lawrence McLellan
Charles Wilbur Mercer
Rollin Roy Nevitt

Captains—Continued

William Henry Pickett
William Polson Smith

Lieutenants

Anthony M. Bennardi
James P. Coll
Alvin H. Diehr
Frank Arnold Edwards
Alexander Haggart
Joseph Jaffe
Wesley W. Kuntz
Harry Edward McCormick
Robert F. McLeod
David Hirst Mills
Joseph E. Noll
Walter J. Price
Eberle Kost Shelton, Jr.
Joseph Albert Striebich
William Pleasant Sumners

BOOK REVIEWS

Surgical Treatment, Volume II. A Practical Treatise on the Therapy of Surgical Diseases for the Use of Practitioners and Students of Surgery, by James Peter Warbasse, M.D., formerly Attending Surgeon to the Methodist Episcopal Hospital, Brooklyn, New York. In three large octavo volumes, and separate desk index volume. Volume II contains 829 pages with 751 illustrations. Per set (three volumes and the index volume): Cloth, $30. Philadelphia and London: W. B. Saunders Company.

This volume covers a vast field of surgical treatment, embracing, as it does, the Treatment of Injuries and Diseases of the Head, The Eye, The Nose, Naso-pharynx and Fauces, Larynx and Trachea, The Mouth, The Ear, The Spine, The Neck, The Thorax, The Breast, The Abdomen, The Pancreas, The Spleen.

It is too little to say that the ground covered has been well done—it is a remarkable achievement. Methods of treatment advised are judicious, up to date, and expressed in such language as to make their carrying out easily comprehensible, teaching the doctor, seeking advice, to give his patient the benefit of the treatment recommended.

The illustrations are numerous and valuable, in that they really represent clearly what they are supposed to represent.

Added to the different operations described, the after-treatment recommended in each will be found an invaluable aid in bringing about a successful and happy termination. There is an excellent index.

Jno. E. Summers.

Surgery in War, by Alfred J. Hull, F.R.C.S., Lieut. Col., Royal Army Medical Corps; Surgeon, British Expeditionary Force, France; Late Lecturer on Surgical Pathology, Royal Army Medical College, Millbank; and Surgeon, Queen Alexandra Military Hospital. With a Preface by Lieut. Gen. T. H. J. C. Goodwin, C.B., G.M.C., D.S.O., Director-General, Army Medical Service. Second edition, with 210 illustrations. Price, $6.00. Philadelphia: P. Blakiston's Son & Company.

In this book will be found the best that has developed in surgery in war. In the author's preface he says: "The object of this book has been to give members of the profession who have not practiced war surgery an account of the treatment which has proven efficacious in our hands. Symptomatology and details of treatment which are found in text-books of general surgery have not been repeated. The book is not intended to be in any sense complete. Surgical knowledge is presupposed, and our efforts have been mainly directed to recounting methods of treatment of the more common injuries of war."

The author is too modest. Not only will there be found what appears as an immense amount of the wisest advice in surgical treatment in military surgery, but this same advice is applicable in the treatment of the wounds and injuries of civil practice.

A. A. W. Petrie writes a short chapter on wound infections. He says: "The first thing to consider is the source and characteristics of the commonly infecting organisms, and then the manner in which they act and react on the tissues. The condition of growth and manner of spread of the anaerobes demand especial consideration, owing to the grave importance of the lesions of gas gangrene which they are able to produce." First, Petri briefly calls attention to the commonly recognized aerobes and then

takes up in a very thorough way a description of the anaerobes, not forgetting to note that "the aerobic infecting, bacteria infecting wounds are faculative anaerobes, and to a greater or less extent possess the power of adapting themselves to anaerobic conditions."

Accompanying this article is a table giving the morphological characteristics of the best established organisms which infect war wounds. A very good description of what happens when a man is wounded is given, showing just how the microörganisms, both aerobic and anaerobic, may be introduced, and how they multiply in a wound, causing infection. In the Treatment of Wounds, Hull not only explains their primary excision, their excision after sepsis has developed, the methods of passing the sutures employed—primary, delayed primary, or secondary sutures—but also drainage, irritation of wounds, and the bath treatment of wounds. He gives a most instructive description of the use of antiseptics in wound treatments, and shows by an interesting table the antiseptic properties of such substances as chloramine-T, eusol, Dakin's solution, chlorine water, carbolic acid, mercuric perchloride, iodine, and several aniline dyes such as brilliant green sulphate, flavine, etc. Emphasis is placed on the ideal antiseptic for use in wounds, as one which "should kill all the parasitic life, while causing no harm to the most delicate body cells, and, rather, it should stimulate these cells towards the process of repair."

In studying the table to which we have referred, it is shown that the aniline greens possess the greatest antiseptic potency.

The Carrel treatment of wounds by Dakin's solution and the dichloramine-T method are briefly but well described. It is in the treatment of wounds by use of the aniline dyes—something little known by the general surgeon—that most interest will be felt, because it is new and promises much. The reviewer finds it almost impossible to procure the recommended dyes in this country.

There is a chapter on the location and removal of foreign bodies. C. H. Browning contributes a chapter on Tetanus, which, both from the standpoint of military and civil surgery, is full of interest. In the treatment of declared tetanus, large, repeated doses of antitoxin are recommended, and the intravenous and intraspinal methods of administration are almost insisted upon. Based upon the results of civil practice, it appears that antitoxic therapy has an undoubted, although not a pronounced, effect in reducing mortality. Thus Permin shows in statistics from Danish hospitals that out of 109 cases treated with serum, 42.3 per cent recovered, as compared with 21.1 per cent of recoveries where antitoxin was not used. Military surgeons are much more uncertain as to the beneficial effects of the serum; their material scarcely justifies logical deductions, because "there are such highly serious complications as gas gangrene, septicemia, septic compound fracture, etc."

Petrie also writes a chapter on Anaerobic Infection and explains the differences in pathology of the invasion from its locus to the surrounding tissue, and the systemic intoxication, pathological findings, etc.

This chapter is followed by another by Hull on the Modes of Infection, clinical symptoms as developed by the different locations of infection, and the treatment indicated.

There are two excellent chapters on the Treatment of Gun-shot Wounds of the Head, and Injuries of the Spine, the former embodying the well-known views and practice of Cushing. There are few differences of opinion among excellent surgeons as to the indicated treatment for, and technique in, injuries of the head. Those of the spine, however, have to date not been worked out satisfactorily. As to the indications for operation in gunshot wounds of the spine, Hull says: "In all cases in which

conductivity of the spine remains, there is hope of improvement in the function. An operation will not harm the cases in which the damage to the cord is too extensive to allow of recovery, and will save the lives and functions of the slighter cases."

There is a chapter on Injuries of the Blood-vessels with complications such as gangrene, different types of aneurism, hemorrhage, and the discussion of the indications and treatment in injuries of special vessels.

Another chapter is devoted to the question of Hemorrhage, primary, secondary, and recurrent; the special treatment indicated, for instance, of amputation, where secondary hemorrhage complicates fracture of the femur, and where it occurs from amputation stumps. This chapter is naturally followed by one on Transfusion of Blood. In it is explained, first, the great benefit of transfusion, its dangers, the selection of donors. An apparently simple, direct method of transfusion is described by Hull in which the donor's radial artery is introduced into the patient's median basilic vein. It is done in the same way by traction ligatures, as may be the introduction of the ureter within the ureter. Other methods are described. The citrate method does not seem to receive the enthusiastic endorsement of Hull, such as is usually accorded it; it is briefly but properly described. Of it, however, he says: "This method is one of the most convenient ways of transfusing blood, and may be recommended for general use."

There are two excellent chapters on Gunshot Wounds of the Joints, and Gunshot Wounds of the Abdomen. This war has shown that, where circumstances permit, the treatment of gunshot wounds of the abdomen as carried out in civil practice is not only the one of choice, but the one of duty.

All of the chapters to which we have just referred have been written by Hull himself. A chapter on Gunshot Wounds of the Chest is contributed by W. Miller, and it embraces the marvelous revolution of ideas as to the treatment of injuries to the lung antedating the war.

R. H. Jocelyn Swan discusses Gunshot Injuries of the Peripheral Nerves. The deductions are based upon a well-digested study of 336 cases, in which practically all of the important peripheral nerves were studied; 203 were operated upon. It is fair to presume that the information gained from this study is valuable, but of course not conclusive. It will be some years before the final results of the treatment of nerve injuries in this war can be sufficiently followed to afford premises upon which positive deductions can be made.

Excellent advice is given upon the subject of amputations, the indications for, and the regional types. Amputations considered from the artificial-limb point of view are discussed, a subject to which too few surgeons have given attention. How many surgeons follow their amputation cases sufficiently to actually learn much about the making and fitting of artificial limbs?

H. E. H. Tracy contributes a chapter on Gunshot Wounds of the Jaw and Face. He calls attention to the fact that the modern method of treating gunshot wounds of these localities was developed by Claude Martin and the Lyon school, and to the French must be given the credit of "the initiative in assuring to the facial wound the combined help of the surgeon and the dentist." Consequently, as early as September, 1914, a committee was formed in Paris to bring about this needed combination. The same combined work was taken up in the British Army, and it may be conceded, I think, that the work of the British is the best systematized, the wounded receiving the best of treatment in the hospitals devoted to their care. This chapter will be found to be full of surprises and interest. It is noted that the gravity of the injuries is not so severe as their horrible appearance would indicate. Septic pneumonia is very rare,

although one would expect it as a complication; in these compound factures of the jaw it is under one per cent. "Septicemia is a negligible factor, while gas gangrene is never met with in the face," neither is tetanus of a virulent type, and when there are no accompanying cranial injuries the shock accompanied with severe facial injury is extraordinarily small.

There is a chapter on Compound Fractures. The Thomas splint, both as a first-aid measure and, with some modifications, as a treatment measure, for fractures of both extremities, is an appliance of choice. The Hodgen splint also has its advocates, and one might say that they have proven most useful in the treatment of war fractures. The use of calipers in the treatment of fractures of the femur is described. The chapter is a very complete one.

A chapter on Shock and its Treatment embraces the well-known views of Crile. Most excellent advice is given on how to avoid operation shock. A statement worth noting is made that "the mortality for amputation through the upper third of the thigh has been more than halved by the employment of nitrous oxide and oxygen anesthesia combined with blood transfusion."

The book is concluded by a chapter on Trench Feet and another on the Later Treatment of Gunshot Injuries, the latter of particular interest to the civilian surgeon.

JNO. E. SUMMERS.

LIFE OF DR. LYMAN SPALDING, The Originator of the United States Pharmacopoeia; Co-laborer with Dr. Nathan Smith in the Founding of the Dartmouth Medical School and its First Chemical Lecturer; President and Professor of Anatomy and Surgery of the College of Physicians and Surgeons of the Western District, at Fairfield, N. Y. By his grandson, Dr. James Alfred Spalding of Portland, Maine. Printed privately. Price, $3.

In reading this interesting biography the reviewer was constantly reminded of the wealth of information overlooked and the inspiration lost by the average physician in his neglect of the study of medical biography. Much may be learned by the perusal of the achievements of Dr. Lyman Spalding, who was one of the most prominent physicians, medical writers and educators in the early days of the Republic. Particularly illuminating are the accounts of the introduction of vaccination into this country by Dr. Benjamin Waterhouse in 1800 and the origin of the United States Pharmacopoeia, the latter especially so in view of the approaching centennial of the pharmacopoeia next year. Dr. Spalding has embodied in his work a large number of letters from prominent physicians which throw light upon the men, manners, conditions and thought of the era in which his grandfather lived. The book is attractively bound and printed in large type on substantial paper. J. R. C.

BOOKS RECEIVED

Books received are acknowledged in this department, and such acknowledgment must be regarded as a sufficient return for the courtesy of the sender. Selections wil be made for review in the interests of our readers and as space permits.

THE SURGICAL CLINICS OF CHICAGO. Volume 3, No. 1. Philadelphia and London: W. B. Saunders Company. 1919. Published bi-monthly. Price per year: Paper, $10.00; cloth, $14.00.

AFTER TREATMENT OF WOUNDS, by R. C. Elmslie, M.S., F.R.C.S., Brevet-Major, R. A. M. C. (T). Philadelphia: P. Blakiston's Son & Company, 1919. Price, $4.00.

A Text-book of Practical Therapeutics, with especial reference to The Application of Remedial Measures to Disease and Their Employment upon a Rational Basis, by Hobart A. Hare, M.D., B.S. 17th Edition. Illustrated. Philadelphia: Lea & Febiger, 1919. Price, $5.50.

Human Infection Carriers—Their Significance, Recognition and Management, by Charles E. Simon, B.A., M.D. Philadelphia: Lea & Febiger, 1919. Price, $2.25.

Elementary Bacteriology and Protozoology for the Use of Nurses, by Herbert Fox, M.D. 3rd Edition, Revised, Illustrated. Philadelphia: Lea & Febiger, 1919. Price, $1.75.

A Treatise on Orthopedic Surgery, by Royal Whitman, M.R.C.S. Eng., F.A.C.S. 6th Edition, Revised, Illustrated. Philadelphia: Lea & Febiger. Price, $7.00.

History of the World War, by Frank H. Simonds. Published for the Review of Reviews Company by Doubleday, Page and Company, Garden City, New York. Volumes, 1, 2 and 3. (Other volumes to follow.) Illustrated. Price, $3.50 per volume.

INSTRUMENTS AND APPLIANCES

A NEW WIRE LITTER FRAME FOR "SHOCK TREATMENT"

CAPTAIN MELVIN P. BADGER

Medical Corps, United States Army

(With five illustrations.)

By "shock" I refer to the condition which accompanies severe wounds, characterized by pallor, rapid weak pulse, shallow respiration, profuse sweating, extreme thirst and a very low blood pressure.

The bodily heat is lowered by the profuse sweating, and the first step in the treatment of these cases is to apply heat, preferably dry hot air.

The basic idea of carrying hot air over a patient with a frame to support the covering is an old one, but a light wire frame attachable to a litter, and dependent on the litter alone for support, is entirely new.

The idea of a light wire frame that would make a hot-air chamber over afpatient receiving "shock treatment," which would support sufficient covering to retain the heat and that would be adaptable for use on a litter at any time, without the aid of cumbersome apparatus, extra wide horses or frames for its support, presented itself while I was engaged in "shock" treatment in the 34th Field Hospital, 7th Division Sanitary Train, A. E. F., France, operating as a Triage, in active service, from October 9 to November 11, 1918.

I have attended two "shock treatment" courses, one at the Univer sity Hospital in Philadelphia, U. S. A., and the other at the University of Dijon in Dijon, France, but have never seen or heard of anyone adapting a wire frame to a litter in this manner. I have also inquired of many medical officers "over here" regarding such a frame, but none had seen or heard of a frame made especially for use on a litter.

Litters being available at all times, this frame was designed especially for litter use in "the field," but may be used on the folding army cot without modification as well.

I have used this frame in the treatment of the "shock" patients in the Triage and it has proved extremely satisfactory.

The base of the frame is made of ¼-inch wire and the supports for the covering are made of ⅛-inch wire, making a very light frame.

Fig. 1 is a diagrammatic sketch, showing the frame with its points of support on the litter. There are six points of support, *a*, beside the rings at the ends of the frame *b*. It will be noticed that the base of the frame is shorter than the litter, but this is explained by the fact that the frame rings *b* slip on the ends of the litter handles and are pushed up to

the sling rings, thus allowing the rings *b* to just slip on the other handles of the litter. The frame is then pushed back an equal distance and it brings both ring ends of the frame an equal distance from the ends of the litter handles; this prevents slipping off at any time. *c* is the frame for the heating apparatus and is designed the same as the rest of the frame. The chamber for the stove attaches to the base of the frame at the foot and is easily detached; *d* are two wire braces for the

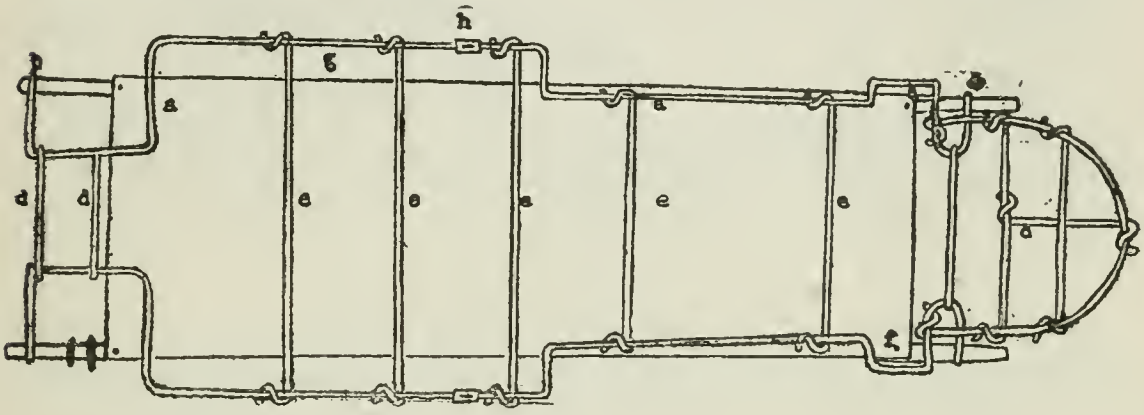

Fig. 1.

frame that are used to hold a blanket used as a pillow; *e* are the supporting braces for the covering; *f* is the space allowed for litter bars; *g* is extra space allowed for arm splints, *h* is the hinged joint with ferrule.

Fig. 2 is a side view of the frame resting on the litter, showing the frame fully assembled.

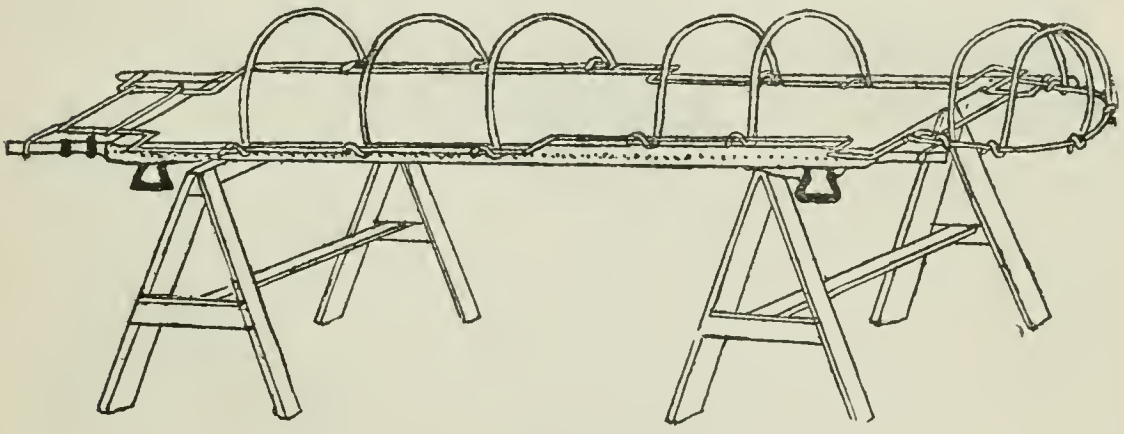

Fig. 2.

Fig. 3 shows that sufficient room has been allowed for the use of arm and leg splints and litter bars.

Fig. 4 shows the frame covering the potato can used as the chimney, with sufficient room to avoid scorching the blankets.

Fig. 5 shows the frame covered with four blankets and completely enveloping the whole.

Wire braces between the supports at the top are not necessary, as the supporting wires are stiff, and by their twisted spiral clip attachment at the base of the frame they prevent sagging either way.

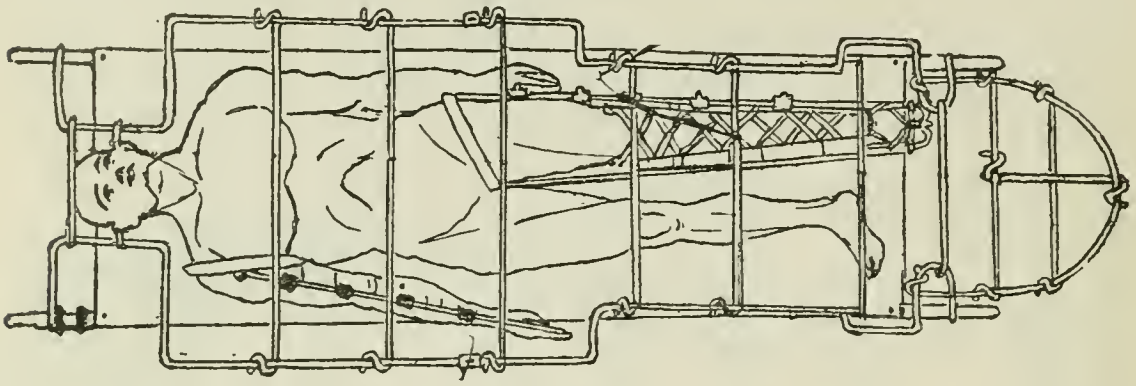

Fig. 3.

By placing a potato or bacon can with one side opened at the top for a chimney on an alcohol or primus stove, intense heat can be generated in a very few moments. After the patient has been thoroughly warmed

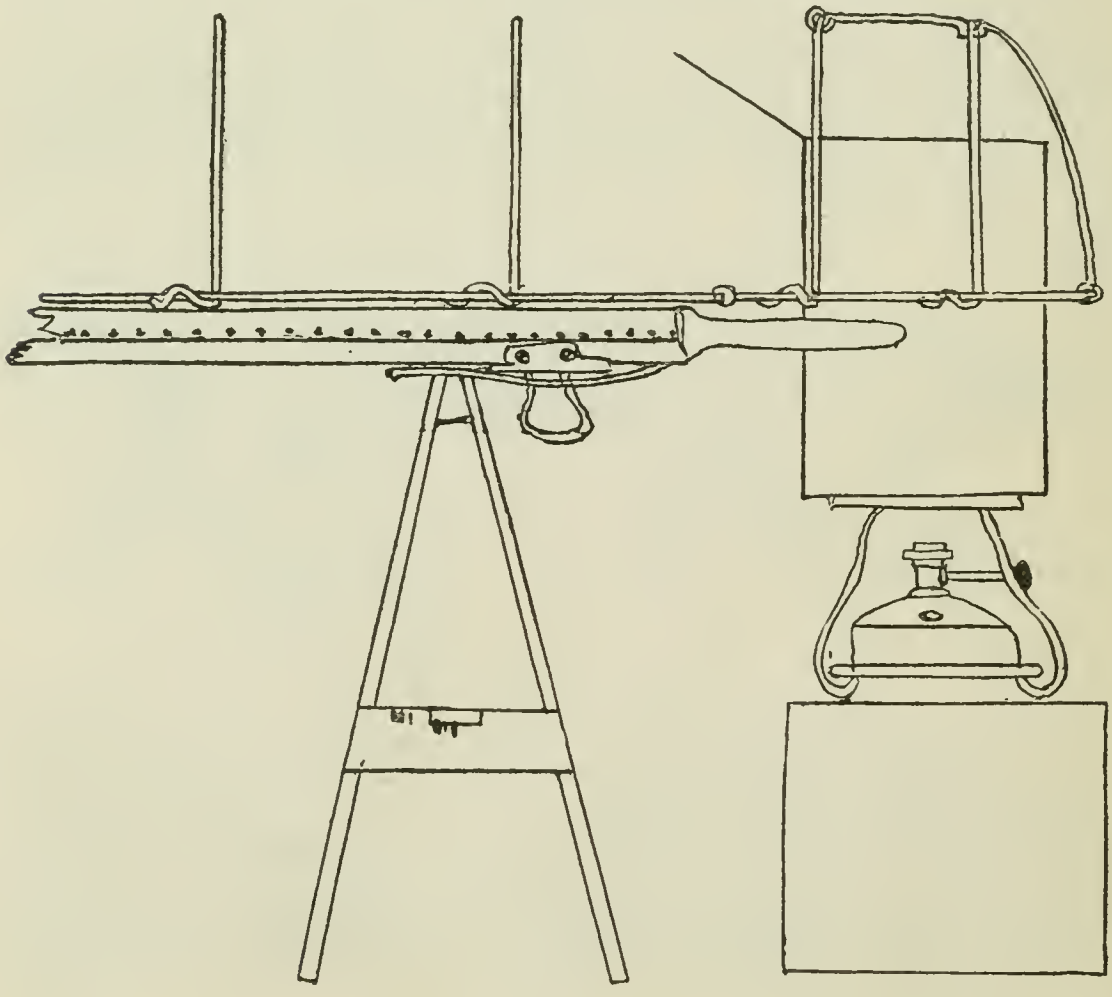

Fig. 4.

a gradual heat may be maintained by the use of canned alcohol in place of the alcohol or primus stove. Heat is used under the patient at the same time so that every part of the patient is warmed simultaneously.

The advantages of a light wire frame like the one described are numerous. It is light in weight, can be carried easily, the wire braces that support the blankets are easily removed by springing the clips at their ends, the base of the frame has a hinge in the center with sliding ferrule that allows it to be folded, and the whole can be tied together, thus taking up very little space in transportation. It has ample room at the foot to accommodate a large can used as a stove without danger of burning the blankets. The feet which are always the coldest receive heat first and an extra amount all the time. Sufficient room is allowed for arm and leg splints and litter bars. Dressings may be changed, trans-

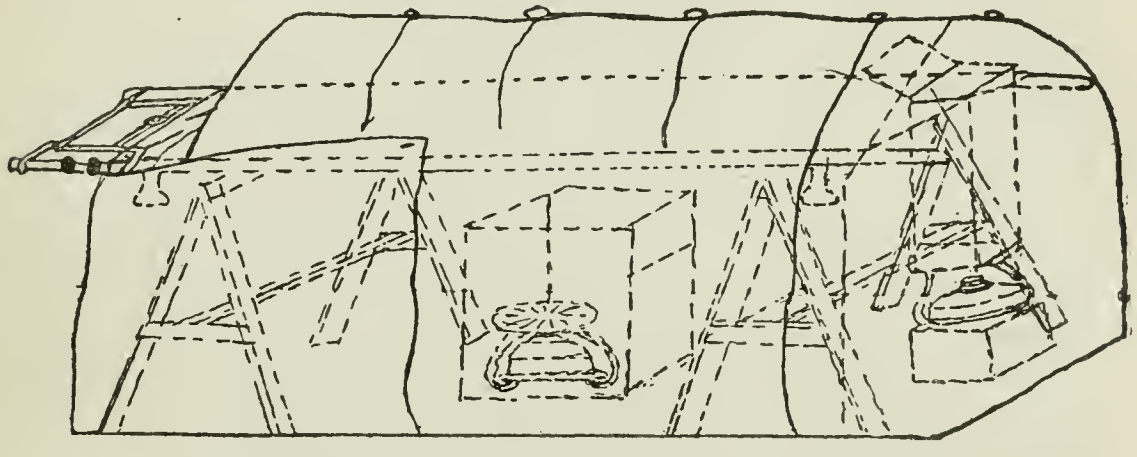

Fig. 5.

fusions of blood or infusion of gum-salt solution may be given without exposing the patient, who is not handled or disturbed in any way in applying the frame, as it will fit on over a patient wrapped in blankets. Only four blankets are used to completely envelop the frame and reach to the floor, and the wire braces at the head serve to hold a blanket used as a pillow. It cannot be pushed off nor can it slip or fall off the litter, as it is securely held by the rings at both ends of the frame. It takes up less room when all assembled than any other frame that could be made of wood, and it can be made in a very short time. It is solely dependent on the litter for its support, could be used on an ordinary cot or bed, and electric bulbs used for the heating.

It may be of interest to readers to know that the first model of this frame was made in an old French chateau built in the year 1118, at Martincourt, France, which is about 18 miles from Metz.

The sketches that accompany this article were made by Sergt. John H. Focht, No. 22 Ambulance Co., 7th Division, Sanitary Train.

Obituary

RAPHAEL BLANCHARD (1858-1919)

When the eminent Professor Raphael Blanchard died in Paris on February 8, 1919, the scientific world knew that it had lost one of its greatest medical zoölogists and medical historians. Heart failure has, indeed, taken a heavy toll of the followers of pure science, and death claimed Blanchard at the relatively early age of one and sixty. Followers of parasitology, including medical officers, sojourning in Paris, knew him as the learned, affable *raconteur*, the cordial host of aristocratic *allure*, who could not do too much for anyone interested in his subject. Lack of space forbids more than mere mention of his distinguished career in science, but a singular and pathetic interest attaches to what he did for the army of his country during the war just ended. The opening of the war meant the end of Blanchard's scientific work; it is noticeable that his *Archives de Parasitologie*, the leading literary organ of his science, was discontinued in the fall of 1914. He therefore turned all his energies to war work, and this is what he accomplished. When the *loi Dumont*, for the general incineration of cadavers in war time, came up in the Chamber of Deputies (March 18, 1915), much was done to relieve it of the odium of popular prejudice by Blanchard's propagandism, particularly his article on the Japanese method of destroying cadavers in war time (1915). He then took up the important question of circularizing hygienic information among soldiers in the field, including propagandism by the cinematograph (1915), and with the aid of the *Ligue sanitaire française*, issued his well-known booklets on the flea, the fly and on disinfection in wartime, which were avowedly inspired by similar publications of the Cambridge professor, A. E. Shipley. These pamphlets, coming as they did from the most authoritative source, were widely distributed among the French officers, Blanchard's view being that such instructions would be most effectively given not to the enlisted men directly but by the commanders of their organizations. Blanchard also collaborated with Laveran in the destruction of mosquito larvae, and he pointed out the priority of American sanitarians in the destruction of flies by special arrangement of manure heaps. His last contribution was one on transportation of the wounded, by means of the aeroplane (1916). To accomplish all this, Blanchard gave up his laboratory work and his *Archives*, devoting the major part of his time to war work. In France, the whole medical profession was liable for war duty. Blanchard's quiet service is evidence of how much can be accomplished by the scientific man, too old for strictly military duty, but impelled by a patriotic motive as lofty as his own.

F. H. G.

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